

Strait of Georgia and Northern Vancouver Island Sport Fishery Creel Survey Statistics for Salmon and Groundfish, 1999

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STRAIT OF GEORGIA AND NORTHERN VANCOUVER ISLAND SPORT FISHERY
CREEL SURVEY STATISTICS FOR SALMON AND GROUND FISH, 1999

by

D. C. Hardie, D. A. Nagtegaal, and L. Nagy

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ABSTRACT

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This report documents the 1999 catch and effort estimates for the Strait of Georgia and Northern Vancouver Island sport fishery creel surveys. Catch and effort statistics for the Strait of Georgia and Northern Vancouver Island tidal sport fishery are presented for each month, Statistical Area and by individual species. Strait of Georgia creel survey data collection began in 1980 and continues today. Historical data are presented from as far back as 1960 and comparisons are made between the current and these historical data to determine trends in catch and effort.

The 1999 Strait of Georgia statistics for statistical areas 13, 14, 15, 16, 17, 18, 19, 28 and 29, were derived from 9,211 fishing interviews and 41 aerial surveys. Anglers conducted an estimated 164,282 boat trips and kept 43,588 chinook, 478 coho, 4,404 chum, 27,845 pink, 492 sockeye salmon, as well as 2,489 halibut, 3,691 lingcod and 67,256 rockfish. The catch and effort for 1999 shows a continuing downward trend. Effort has dropped 75% from a high of 664,517 boat trips in 1988 and chinook catch has dropped 88% from a high of 369,445 in 1984. Chinook catch did however increase 108% from the total of 20,923 in 1998. Total salmon catch per boat trip has increased from a historical low of 0.24 in 1998 to 1.00 in 1999. Among salmon examined for adipose-clips, 4.1% of chinook and 72% of coho had adipose fin clips. The age composition of chinook catch shifted back to the normally dominant age 4 from age 3. The chinook catch consisted of 0.3% age 2 fish, 73.4% age 3 fish, 21.4% age 4 and 4.9% age 5 and older fish. The length frequency distributions of the chinook and coho are also given.

The 1999 Northern Vancouver Island statistics for statistical area 12, were derived from 3,223 fishing interviews and 12 aerial surveys. Anglers conducted an estimated 39,151 boat trips and kept 7,813 chinook, 430 coho, 607 chum, 52,359 pink, 1,538 sockeye salmon, as well as 6,713 halibut, 2,056 lingcod and 19,354 rockfish. The catch and effort for 1999 showed an increase of 140% from 16,408 boat trips in 1998. Total salmon catch also increased 236% from 18,660 in 1998. Total salmon catch per boat trip has increased from 1.14 in 1998 to 1.60 in 1999. Among chinook salmon examined for adipose-clips, 3.6% had adipose fin clips. The age composition of chinook catch consisted of 36.5% age 3 fish, 53.3% age 4 and 10.2% age 5 and older fish. The length frequency distributions of the chinook and coho are also given.

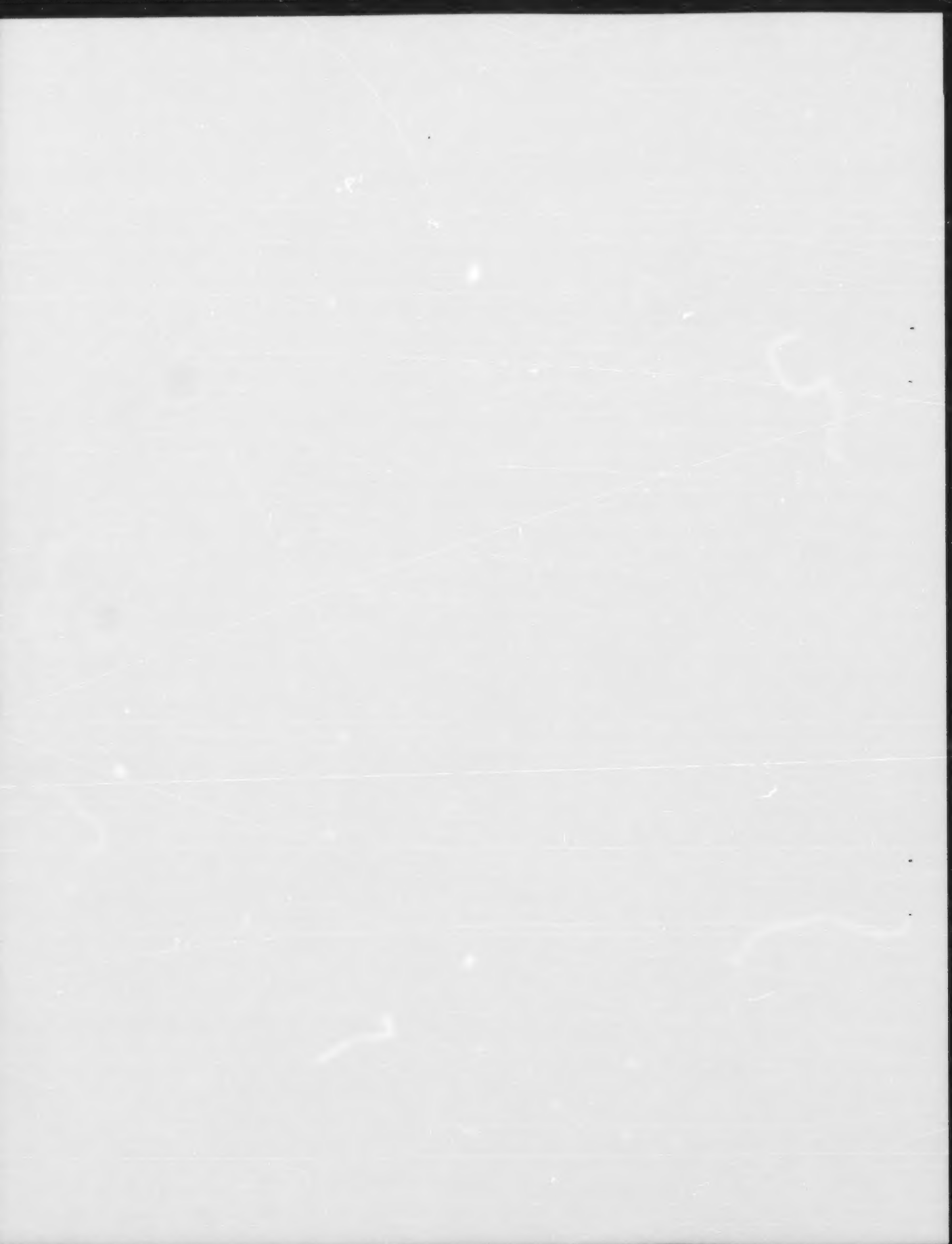
RÉSUMÉ

Hardie, D. C., D. A. Nagtegaal, and L. Nagy. 2001. Strait of Georgia and Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1999. Can. Manuscr. Rep. Fish. Aquat. Sci. 2553 : 111 p.

Le présent rapport documente les estimations des captures et de l'effort de 1999 d'après les enquêtes sur la pêche sportive pour le détroit de Georgia et le nord de l'île de Vancouver. Nous présentons les statistiques sur les captures et l'effort de la pêche sportive dans les eaux à marée pour le détroit de Georgia et le nord de l'île de Vancouver par mois, par district statistique et par espèce. La collecte de données des enquêtes sur la pêche sportive dans le détroit de Georgia a commencé en 1980 et se poursuit actuellement. Les données historiques présentées remontent jusqu'en 1960, et nous comparons les données actuelles à ces données historiques pour déterminer les tendances des captures et de l'effort.

Les données de 1999 pour le détroit de Georgia, dans les districts statistiques 13, 14, 15, 16, 17, 18, 19, 28 et 29, sont le produit de 9 211 entrevues avec des pêcheurs et de 41 relevés aériens. Selon nos estimations, les pêcheurs sportifs ont effectué 164 282 sorties en bateau et gardé 43 588 quinnats, 478 cohos, 4 404 kétas, 27 845 saumons roses, 492 saumons rouges, ainsi que 2 489 flétans, 3 691 morues-lingues et 67 256 sébastes. En 1999, les captures et l'effort présentent une tendance continue à la baisse. L'effort a baissé de 75 % par rapport au sommet de 664 517 sorties en bateau en 1988, et les prises de quinnats ont chuté de 88 % par rapport au sommet de 369 445 poissons en 1984. Les prises de quinnats ont toutefois augmenté en 1999 de 108 % par rapport au total de 20 923 de 1998. Les captures totales de saumons par sortie ont augmenté, passant d'un plancher historique de 0,24 en 1998 à 1,00 en 1999. Parmi les saumons examinés à cette fin, 4,1 % des quinnats et 72 % des cohos présentaient l'ablation de la nageoire adipeuse. La composition par âge des quinnats, qui était dominée par les poissons d'âge 3, est revenue à la normale avec dominance des poissons d'âge 4. Les prises de quinnats consistaient en 0,3 % de poissons d'âge 2, 73,4 % de poissons d'âge 3, 21,4 % d'âge 4 et 4,9 % de poissons d'âge 5 et plus. Nous donnons également les distributions de fréquence des longueurs des quinnats et des cohos.

Les données de 1999 pour le nord de l'île de Vancouver, dans le district statistique 12, sont le produit de 3 223 entrevues avec des pêcheurs et de 12 relevés aériens. Selon nos estimations, les pêcheurs sportifs ont effectué 39 151 sorties en bateau et gardé 7 813 quinnats, 430 cohos, 607 kétas, 52 359 saumons roses, 1 538 saumons rouges, ainsi que 6 713 flétans, 2 056 morues-lingues et 19 354 sébastes. En 1999, les captures et l'effort présentent une hausse de 140 % par rapport à 16 408 sorties en bateau en 1998. Les captures totales de saumons ont aussi augmenté de 236 % par rapport au total de 18 660 poissons en 1998. Les captures totales de saumons par sortie ont augmenté, passant de 1,14 en 1998 à 1,60 en 1999. Parmi les quinnats examinés à cette fin, 3,6 % présentaient l'ablation de la nageoire adipeuse. La composition par âge des quinnats capturés consistait en 36,5 % de poissons d'âge 3, 53,3 % de poissons d'âge 4 et 10,2 % de poissons d'âge 5 et plus. Nous donnons également les distributions de fréquence des longueurs des quinnats et des cohos.



PART I
STRAIT OF GEORGIA



INTRODUCTION

Part 1 of this report documents the 1999 catch and effort statistics for the Strait of Georgia sport fishery and presents the methodology for collecting these data. Data are presented in tables and graphs with catch and effort dating back to 1960. The 1999 catch and effort are displayed in tables by month, Statistical Area and species. Graphs showing historical trends and comparisons in catch and effort for 92-96 average, 1997, 1998 and 1999. The 1999 report is one of a series of annual reports documenting the activities of the creel survey and providing official Strait of Georgia tidal sport fishery catch statistics. A list of previous reports in this series may be found in Appendix A. In this report all tables, figures and appendices are located at the end of text.

BACKGROUND

The Strait of Georgia fishery supports one of the most valuable recreational fisheries in British Columbia. Coded-wire tag recoveries indicate these fish stocks consist of Fraser River, Puget Sound and East Coast Vancouver Island streams. These fish stocks contribute to the East and West Coast fisheries. There has been evidence of declining stocks since the 1970's (Argue et al. 1983). Various groups (Commercial, Native and Recreational) on both sides of the border depend on these stocks. There is also evidence from declining marine survival rates of salmon stocks (Cross et al. 1991; Beamish et al. 1994), that marine environmental factors may be involved.

The creel survey study area (Fig. 1, Appendix B) comprises over 5,900 km² of water surface area and has in excess of 2,400 km of shoreline. From its southern end near Victoria, the area extends about 290 km northwest to Campbell River and at its greatest width is about 32 km wide. Two major population centres, Vancouver and Victoria, and many smaller centres such as Nanaimo and Campbell River are located within the study area. Over 500 boat launch ramps, marinas and public wharves as well as thousands of private boat launching facilities provide access.

The recreational fishery is active throughout the year but over 85% of the effort occurs in the summer months of May to September (Collicutt and Shardlow 1993). The most sought after species in the Strait of Georgia recreational fishery are the chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon, but in recent years significant fisheries directed at pink (*O. gorbuscha*), sockeye (*O. nerka*), rockfish (*Sebastes*) and halibut (*Hippoglossus stenolepis*) have developed in certain areas.

The size of vessel, methods of fishing and terminal tackle vary widely depending on location and time of year. Vessels range from 4 m car-top boats to yachts more than 17 m in length, although most boats would be in the 5 m to 8 m range. Popular fishing methods include trolling, mooching, bucktailing and stripcasting.

Over the past three decades the recreational fishery in this area has undergone dramatic changes. Prior to 1960, the numbers of chinook and coho taken by the commercial troll fleet was almost double that taken by sport fishermen. During the 1980's however, the situation has reversed with the sport fishery taking more than triple the commercial harvest of chinook and coho. The recreational fishery is still the primary harvester of chinook and coho in the Strait of Georgia. Effort in the recreational fishery has fluctuated from about 200,000 boat trips in 1960 to peaks of 769,000 in 1980 and 600,000 in 1988 to an all time low of 162,000 boat trips in 1998. The 1999 fishery showed a minor 1% increase in effort to 164,000 boat trips. The chinook catch climbed through the 1960's with a peak in the mid 1970's of over 400,000 pieces and a second peak of 370,000 pieces in 1984. A steady decline has occurred since, to a low of 20,000 pieces in 1998. The chinook catch for 1999, showed a significant improvement of 108% to 44,000 pieces. Although annual coho catches have varied widely, an increase from about 200,000 pieces in 1960 to over one million pieces in 1988 was recorded. A gradual decline from 1988 levels to 100,000 pieces in 1997 has followed the general decline of stocks. The 1999 coho catch was an all time low of 500 pieces, this was due, however, to a majority of areas being closed to coho retention.

From 1956 to 1976, estimates of catch and effort in the sport fishery published by the Department of Fisheries and Oceans (DFO) were based on subjective assessments completed by Fishery Officers and on small-scale creel surveys. The general lack of statistical rigor and consistency associated with these methods of catch estimation as well as the rapid growth of the recreational fishery led to the initiation of the Strait of Georgia Creel Survey Pilot Program in 1980 (DPA 1982). The survey has been run continuously (with minor interruptions) since then. Although many details such as sampling locations and times are regularly updated to reflect changes in the fishery, the basic design of the survey remains similar to the pilot project conducted in 1980.

Creel survey data are used for a variety of management and reporting purposes. Catch and effort information is also used by local people (both inside and outside DFO) to monitor the fishery in their area. In addition, creel survey information is used to predict the effect of regulation changes and to measure the success of conservation actions imposed. The adipose clip information collected during the survey is supplied to the Mark Recovery Program (Kuhn et al. 1988) and used in combination with other data for exploitation rate, marine survival and stock distribution analyses.

OBJECTIVES

The specific objectives of the 1999 Strait of Georgia creel survey were:

1. To estimate the sport angler effort and catches of chinook, coho, chum, pink, sockeye salmon, halibut, lingcod, rockfish and other finfish by month for Statistical Areas 13 through 19, 28 and 29; and to estimate the number of chinook, coho and other salmon released by anglers.

2. To estimate the catch rate for adipose-clipped chinook and coho in the sport fishery.
3. To estimate the age composition and mean length-at-age for chinook, and the length frequency for chinook and coho.

METHODS

STUDY DESIGN

The design of the Strait of Georgia Creel Survey conducted in 1999 was similar to that used by DPA Consulting Ltd. (1982) with some modifications to the data analysed, sampling intensity, flight routes and data processing. It is comprised of two independent surveys: angler interviews and aerial overflights. Angler interviews provide data on sport fishing catch per unit effort (CPUE) and daily activity patterns. Aerial overflights provide estimates of the total sport fishing effort in the study area at the time of the aerial survey. These data are combined to provide monthly estimates of total sport fishing effort and total catch of salmon and groundfish in the sport fishery. In its simplest form, the estimated total catch is calculated by multiplying the estimated total effort by CPUE.

The fishery was stratified according to the following criteria:

1. Month. The survey operated from April through to and including October. Interview intensity was reduced for October due to lack of fishing activity when only Statistical Area 13 was surveyed.
2. Geographic area. Catch and effort estimates were produced for Statistical Areas 13 through 19, 28 and 29 (Fig. 1, Appendix B).
3. Day type. Weekend and mid-week days were considered independently because sport fishing activity is known to differ for the two types of days.
4. Time of day. Sampling shifts (one shift is a set number of consecutive hours of interviewing anglers at one site by one creel surveyor) were conducted during set time periods. From April to October sampling was conducted during either an early shift (approximately 0700 to 1500 hours) or a late day shift (approximately 1500 to 2300 hours).
5. Guided versus unguided anglers. Certain sites are known to have considerable guided fishing effort. Unpublished data from previous surveys in this series indicate that the CPUE from guided boats differs markedly from unguided boats. Guided vs. unguided, was documented by the interviewer, however, at this time the catch estimate program does not generate catch and effort estimates differently for the two parties.

In each region, various landing sites were chosen as locations for surveyors to conduct interviews. Site selection was based on four criteria: representativeness, traffic volume, site accessibility and adequate observation points. Discussions with local fishers, marina operators and Fisheries Officers and data from previous surveys were used to choose sites that were representative of the local sport fishing activity (i.e. sites which were used by a wide cross-section of anglers). Sites with expected traffic volumes of more than 15 boats per day in the summer were considered as possible sampling locations. Expected traffic volumes for sites were compiled from previous surveys or from discussions with marina operators or local Fisheries Officers.

Site accessibility refers to whether an interviewer can easily reach a site by car or ferry during the defined shift hours. Only sites with good accessibility were selected. As a result, landing sites on most of the islands in the Strait of Georgia were excluded from the survey. This was not expected to be a major factor, however, since most of the fishing occurs from accessible sites. The final criterion, adequate observation points, was essential for interviewers to obtain an accurate count of all boats returning to a landing site. At some large marinas, two sampling sites were identified if it was impossible to see all boats returning.

Allocation of sampling effort among months followed the same general pattern as fishing effort, that is, more effort was allocated during the summer when fishing effort is at its highest. Allocation of sampling effort among regions (groups of Statistical Areas) also followed fishing effort patterns. Within each month, each chosen site was allocated between 6 and 10 shifts. These shifts were divided equally among weekend and mid-week days and early and late daily time periods.

LGL LTD. environmental research associates conducted data collection, entry and preliminary processing. Fisheries and Oceans Canada conducted the estimation of catch and effort statistics.

DATA COLLECTION

Angler Interviews

Surveyors were stationed at access points for scheduled shifts to interview anglers as they returned from fishing. The number of boats returning to a site during a shift as well as the number of interviews attempted and completed were recorded on a tally sheet. For each boating party landing, the following information was recorded on an interview form (Fig. 2):

1. Total number of anglers in the boat.
2. Time of landing.
3. Whether the party had been sport fishing.
4. Guided vs. Non-guided.
5. Residency of anglers.

6. Time of departure and length of trip.
7. Time during which fishing lines were in the water.
8. Average number of lines in the water.
9. Catch Summary: -Total number and species of kept and released fish for each of the 3 sub-Statistical Areas.
-Number of hours spent fishing in each sub-Statistical Area.
-Number of adipose-clipped and non-clipped chinook and coho in the catch.
10. Number of hours directed at each species.
11. Loss of salmon to seals or sea lions.

Interviewers trained in fish identification inspected each boating party's catch. Landed chinook and coho were checked for a missing adipose fin, which indicates the presence of a coded-wire tag, embedded in the fish's nose cartilage. In addition, scale samples for age determination and measurements of nose-fork length were taken during every sampling shift. Five scales were removed from the INPFC (International North Pacific Fisheries Commission) preferred area of each biosampled chinook (Mosher 1968).

In 1999, interviews were conducted each month at a maximum of 35 of the 50 designated landing sites (boat ramps, marinas, or resorts, Fig. 1) representative of the sport fishing activity in the survey area. Targets of desired precision and number of surveyors available dictated the number of sites selected in each area. For each area - day type - work block stratum, sampling shifts at a site were chosen on a near random basis from the total number of shifts available. For definition of the above terms (day type, work block, shift) see Appendix C.

Aerial Overflights

Aerial surveys were conducted by J. O. Thomas in conjunction with Transport Canada from airplanes travelling along pre-defined routes (Fig. 3). This allowed observers to count vessels actively sport fishing throughout the Strait of Georgia. Planes flew at an altitude of 150-210 m (500-700 feet) to facilitate a broad range of vision and still allow easy identification of vessel type. Each plane carried one observer; the observer counted sport fishing boats in the flight path.

The flight path and time of departure were designed to cover major concentrations of sport fishing activity at peak periods. To maximise precision, flying times during which fishing effort was rapidly changing were avoided. The number of overflights each month was governed by budget constraints, targets of desired precision and by the expected number of interviews from a given number of sampling shifts (English et al. 1986). The days for overflights during a month were randomly selected for each day type (weekday and weekend).

DATA ANALYSIS

Data analysis included calculation of catch and effort statistics, calculation of variance of total fishing effort and total catch, estimation of marked chinook and coho salmon, estimation of age and length composition of chinook catch and length frequency distribution of coho. Established methods and equations were used to analyse the above data (Appendix C).

RESULTS

DISTRIBUTION OF SAMPLING EFFORT

A total of 15,012 interviews, of which 9,211 involved actively fishing anglers, and 41 overflights were conducted in 1999 (Table 1). The monthly distribution of interviews generally reflected the monthly distribution of fishing effort (number of boat trips, Table 3, Fig. 4). Interview effort was limited during October to the northern portion (Statistical Area 13) of the Strait of Georgia (Table 1). The total interviews represent 9.1% of the estimated total fishing effort for the entire study area (164,282 boat trips, Table 3). The interviews involving actively fishing anglers represent 5.6% of the total fishing effort and ranged in each Statistical Area from lows of 2.1% in Area 28 and 2.4% in Area 15 to a high of 8.9% in Area 29 (Tables 1 and 4).

SPORT FISHING EFFORT AND CATCH

The 1999 Strait of Georgia sport fishing catch and effort statistics are summarised for each species by month (Tables 3, 5, 7, 9 and 11) and by Statistical Area (Tables 4, 6, 8, 10 and 12). Fishing effort and catch statistics by species are presented for each combination of month and Statistical Area (Appendices D-1 to D-12).

Anglers made 164,282 boat trips during 1999; this is a 1.2% increase in effort from 1998. The 1999 effort is a 75% drop from the historical peak of 664,517 trips in 1988 (Table 2, Fig. 5). The fishing effort followed the same general seasonal pattern as seen in previous years where effort levels climbed steadily from April, peaked in August and declined in September and October (Table 3, Fig. 6).

The total finfish sport catch in the Strait of Georgia was estimated at 189,464 pieces (including steelhead and cutthroat trout) and consisted of 41% salmon, 9% groundfish, 35% rockfish and 15% other finfish (Tables 3, 5, 7 and 11). Anglers released an additional 105,792 salmon of mixed species (Appendix D-8).

The major regulation change, which affected the 1999 Strait of Georgia sport fishery were the large area closures on the West Coast of Vancouver Island, July 15 and August 1, 2000. Also area 19, south of a line from Cadboro Point to the International boundary was closed to fishing for salmon from August 16 to September 30 (Appendix

F). The zones consisted of Red (salmon fishing restricted except for experimental fisheries), Special Management (Upper Skeena, Thompson River and other salmon stocks of concern are prevalent; special restriction apply. No coho retention) and Yellow (Salmon fishing opportunities for all species). Regulation changes introduced in 1998 and which remain in affect are:

1. Only barbless hooks were to be used when fishing for salmon, throughout the coast.
2. Non-retention of coho in all B. C. tidal and non- tidal waters was enforced with the exceptions of a few selected terminal fisheries such as the mouth of the Capilano River (Statistical Area 28), a portion of Sechelt Inlet (Area 16) and the Big Qualicum River (Area 14). Coho daily limits were two with a possession limit of four; minimum size was 41 cm.
3. There were area closures on sockeye salmon.

General regulations included a minimum size limit for chinook of 62 cm, with a daily limit of two, possession of four, and an annual limit of 15 for the Strait of Georgia (Cape Sutil to Cadboro Bay). In a portion of Statistical Area 19 (Cadboro Bay to Sheringham Pt.), the minimum size limit for chinook was 45 cm, with a daily limit of two, possession of four, and an annual limit of 20. See appendix G for a historical synopsis of regulation changes.

Salmon

Salmon sport catches for the Strait of Georgia in 1999 totalled 76,808 pieces (Tables 3 and 4) and consisted of 57% chinook, 1% coho, 6% chum, 36% pink and 1% sockeye.

In 1999, anglers kept 43,588 chinook (Tables 3 and 4), compared to 20,923 in 1998 and 56,332 in 1997 (Fig. 5, Appendix E-1). Although chinook catch increased 108% from 1998, chinook catch has dropped 88% from the historical peak of 369,445 pieces in 1984. The 1999 monthly chinook catches peaked in June but remained at similar levels for July and August (Table 3, Fig. 7). The seasonal average catch efficiency for chinook increased from 0.13 in 1998 to 0.27 fish per boat trip overall and peaked in the summer months at 0.37 fish per boat trip (Table 13, Fig. 8). Catch patterns were similar to those in recent years.

The spatial distribution of chinook catch followed a similar pattern to previous years. The highest catches were taken in Area 13 (22% of total), Area 14 and 17 (20%), and Area 19 (18%) (Table 4, Fig. 9). The chinook catch per unit effort (CPUE) was 0.41 for Area 17, 0.38 for Area 14 and 0.27 for Areas 13, 15 and 16. Peak catches occurred during June, July and August.

The 1999 coho catch was 478 pieces (Tables 3 and 4). Monthly coho catches peaked in September (Fig. 10 and 11). The non-retention of coho for most of the 1999

sport fishing season, continues to dramatically lower the catch estimates from previous years. Of the coho catch, 88% occurred in Area 13.

In 1999, Strait of Georgia anglers caught 4,404 chum (Table 3, Fig. 12), with the entire catch coming from Area 13. Also 27,845 pink (Table 3, Fig. 13) of which 86% came from Area 13 and 492 sockeye (Table 3, Fig. 14), where the highest catches were from Area 19 (68%; Table 4).

The average number of salmon caught during each boat trip in 1999 increased from 0.24 in 1998 to 1.00 (Table 13). As seen below, the 1999 is returning to the range of averages seen in recent years.

Year	CPUE
1990	1.46
1991	1.18
1992	1.59
1993	2.30
1994	0.89
1995	1.07
1996	0.81
1997	1.09
1998	0.24
1999	1.00

In 1999, Areas 19 (25%) and 13 (21%) showed the highest effort expended with a total salmon catch per effort of 0.28 and 1.10, respectively (Table 4, Fig. 15). Area 13 recorded the highest CPUE at 1.10 fish per trip.

There were also significant numbers of salmon caught and released in 1999. A total of 60,423 chinook and 14,000 coho were released. Area 14 recorded the greatest number of salmon hooked and released followed by Area 17 (Table 4, Appendix D-8).

Groundfish

While salmon accounted for the majority of the total finfish sport catch historically, the 1999 Strait of Georgia catch consisted of 112,656 groundfish, which made up 59% of the overall catch (Tables 3 and 4). The species composition of the groundfish catch, based on the Tables 3, 5, 7 and 11 data, is as follows:

Groundfish Species	Catch	% of Total Groundfish Catch	Major Catch Area
Halibut (<i>Hippoglossus stenolepis</i>)	2,489	2%	19
Lingcod (<i>Ophiodon elongatus</i>)	3,691	3%	13
English sole (<i>Parophrys vetulus</i>)	8,106	7%	19
Rockfish (<i>Sebastes</i> spp.)	67,256	60%	13
Other Finfish (Tables 5 and 11)	31,114	28%	16
Total	112,656	100%	

The majority of the groundfish catch was taken in the summer months, reflecting the high fishing effort in the summer (Tables 5, 7, 9 and 11; Fig. 6). Catch by Statistical Area for rockfish was highest in Area 13 (35% of total; Table 8). Lingcod were caught in greatest numbers in Area 13 (37% of total; Table 6), while the largest halibut catch came from Area 19B (97% of total; Table 6). Area 16 produced the largest catch of other finfish (Table 12).

Rockfish species were identified for the entire survey area in 1999, catch and release estimates were generated for nine species (Tables 7, 8, 9 and 10). The major catches are shown below. The "other" rockfish category consists of canary (*Sebastes pinniger*), china (*S. nebulosus*), redstripe (*S. proriger*), tiger (*S. nigrocinctus*), yellowtail (*S. flavidus*) and unidentified species.

Rockfish Species	Catch	% of Total Rockfish Catch	Major Catch Area
Black (<i>Sebastes melanops</i>)	197	0.3%	19
Copper (<i>Sebastes caurinus</i>)	8,906	13%	13
Quillback (<i>Sebastes maliger</i>)	39,372	59%	13
Yelloweye (<i>Sebastes ruberrimus</i>)	2,894	4%	16
Other (<i>Sebastes</i> spp.)	15,887	24%	
Total	67,256	100%	

In addition to the 67,256 rockfish harvested in 1999, an additional 39,927 rockfish were released (Tables 9 and 10). An additional catch of 13,937 other finfish and 32,424 shellfish were harvested (Table 11) as well as 65,308 other finfish released and 35,356 shellfish released (Table 12). The other finfish category consists of mackerel and unidentified other finfish (Appendix H) which do not fall into the salmon, groundfish or rockfish catch tables. The shellfish catch consisted of 0.8% other crab, 34.6% clams, 0.1% octopus, 46.8% dungeness crab, 9.4% rock crab and 8.3% oysters.

The CPUE for rockfish (Table 13, Fig. 16 and 17) was relatively constant throughout the creel survey period and averaged 0.41 fish per boat trip, while the CPUE for halibut was 0.02 and lingcod was 0.02 fish per boat trip (Table 13). The CPUE for all

non-salmon species and for total finfish during 1999 was 0.69 and 1.00, respectively (Table 5).

BIOLOGICAL DATA

Percentage and Catch of Adipose-clipped Chinook and Coho

In 1999, 2,564 chinook and 51 coho were examined for adipose-clips. Tables 14 and 16 show for chinook and coho respectively, the number of clips observed and the total fish inspected by month and region. The data were presented by Region since some Statistical Areas had insufficient numbers of fish examined for clips in some months, and those data were included with other Areas. Three Regions were defined: the Northern Gulf represented by Areas 13-16; the South Gulf represented by Areas 17, 18, 28 and 29 and the Victoria region represented by Area 19.

Among chinook examined for adipose-clips, 4.1% had clips. The observed proportion of chinook adipose-clips was very even through out the Strait. (Table 14). Among coho examined, 72% had adipose clips. Monthly catch estimates of adipose-clipped chinook are shown by Region in Table 15.

From the Strait of Georgia fishery, a total of 372 chinook with adipose-clips were returned to the head recovery program for coded-wire tag (CWT) extraction and decoding. The CWT data show that the main contributing rivers from Washington State were the Skagit River (34) and the Nooksack River (17; Table 17). British Columbia's main contributing rivers were the Chilliwack River (110), Cowichan River (39), Nanaimo River (21) and the Harrison River (17; Table 17).

Catch-At-Age for Chinook

During 1999, 1,960 chinook biological samples were collected for age and length analysis. Of this total, 1,723 fish were aged. Table 18 shows the monthly number and percent age composition of chinook sampled for age. All ages shown in this report represent the saltwater age. The age data are summarised graphically in Figure 18. The monthly age proportions were applied to the estimated monthly chinook catches to provide a breakdown by age group (Table 19).

In 1999, the chinook sport catch in the Strait of Georgia consisted primarily of age 3 fish (73.4%), followed by age 4 fish (21.4%), age 5+ (4.9%) and age 2 fish (0.3%). Figure 18 and Table 18 show the shift in the age composite of sampled chinook, and hence of chinook catch (Table 19). Age 3 fish were the dominant component of the catch throughout the year with age 4 fish primarily making up the remainder of the catch. The dominance of age 3 fish returns the catch distribution back to the historical trend, in 1998 age 4 fish dominated the catch (55%), and age 4 fish has only been the dominant component of the catch in one other year (1990).

% Age Composition of Chinook					Reference
Catch Year	2	3	4	5+	
1983	57.1	25.5	14.2	3.1	Shardlow et al. (1989a).
1984	21.6	67.3	9.4	1.7	Shardlow and Collicutt (1989a)
1985	6.6	70.8	20.6	2.0	Shardlow and Collicutt (1989b)
1986	10.9	44.9	40.4	3.8	Shardlow and Collicutt (1989c)
1987	7.8	62.1	25.0	5.2	Shardlow and Collicutt (1989d)
1988	26.4	35.3	35.4	2.8	Shardlow and Collicutt (1989e)
1989	3.1	83.3	10.5	3.1	Collicutt and Shardlow (1990)
1990	4.0	37.0	53.0	6.0	Hardie et al. 1999
1991	2.0	67.0	25.0	6.0	Hardie et al. 1999
1992	7.0	58.0	28.0	7.0	Hardie et al. 1999
1993	1.0	69.0	26.0	4.0	Hardie et al. 1999
1994	2.0	50.0	40.0	8.0	Hardie et al. 1999
1995	2.0	62.0	29.0	7.0	Hardie et al. 1999
1996	1.0	70.0	26.0	3.0	Hardie et al. 1999
1997	0.0	66.0	29.0	5.0	Hardie et al. 1999
1998	5.0	31.0	55.0	9.0	Hardie et al. 1999
1999	0.3	73.4	21.4	4.9	*

*Calculated from this report's yearly catch estimates

Mean Length-At-Age for Chinook

Table 20 shows the monthly mean nose-fork length at age for the 1,716 chinook for which both length and age data were available. Figure 19 shows the length frequency distribution for all the measured chinook. The overall mean length for age 3 fish was 72.0 cm and age 4 fish was 78.9 cm (Table 20). The largest chinook sampled was 127 cm (age 6) at Sunny Shores Marina (Area 19).

As shown below, there was a decrease in the percentage of sub-legal size chinook (45 cm in the Victoria area and 62 cm in the Strait of Georgia). This percentage has dropped and remained low since it's highest level in 1989 when the 62 cm size limit was implemented.

Year	Sub-legal Chinook		Reference
	Victoria	Strait of Georgia	
1989	2%	20%	Collicutt and Shardlow, 1990
1990	0.01	10%	Collicutt and Shardlow, 1992
1991	<1%	7%	Collicutt and Shardlow, 1993
1992	0.02	2%	Hardie et al. 1999
1993	1%	2%	Hardie et al. 1999
1994	0%	2%	Hardie et al. 1999
1995	0%	3%	Hardie et al. 1999
1996	0%	1%	Hardie et al. 1999
1997	0%	2%	Hardie et al. 1999
1998	1%	6%	Hardie et al. 1999
1999	0%	<1%	This report

Length Frequency Distribution for Coho

Figure 20 shows the length frequency distribution for the 51 coho sampled in 1999. The mean size of coho in 1999 was 59 cm, which ends the decline in coho size; however 1999 had the lowest number of coho caught and biosampled in the history of the Strait of Georgia creel survey. In the 1989 report (Collicutt and Shardlow 1990), an overall decline from 1986 to 1989 in the size of landed coho was noted. A similar size reduction trend appeared to be occurring once again in 1996 to 1998, as shown below:

Coho mean annual length		
Year	Mean Length	Sample Size
1986	53.4	5354
1987	50.5	4997
1988	50.0	13000
1989	49.6	6883
1990	51.4	8959
1991	54.2	2281
1992	53.2	19602 92 to 97 Unpublished reports
1993	51.0	22203
1994	53.7	5890
1995	56.3	1672
1996	53.0	2257
1997	49.7	1710
1998	49.0	60 Hardie et al. 1999
1999	58.7	51

SUMMARY

A sport fishery creel survey was conducted in the Strait of Georgia in 1999 to estimate the catches of all the important recreational finfish species and the total sport fishing boat trips. In the report, data are presented by both month and Statistical Areas. Comparisons are made to previous data to determine trends in catch and effort. From the catch and effort estimates, CPUE could be calculated. These data also provide estimates of the number of chinook and coho salmon with adipose fin clips. Also the age composition of chinook and the length frequency distributions of chinook and coho are shown.

Fishing effort had dropped 76% from a high of 664,517 boat trips in 1988 to a low of 162,296 in 1998. The 1999 season has shown a minor increase in effort (1.2%) to 164,282 boat trips. The chinook catch increased 108% from 20,923 in 1998 to 43,588 in 1999. This is still a decline of 88% from a high of 369,445 in 1984. Total salmon CPUE improved from 0.24 in 1998 to 0.47 in 1999.

Sport fishers made an estimated 164,282 boat trips in the Strait of Georgia. A total of 15,012 boating parties, of which 9,211 were actively fishing, were interviewed at a monthly maximum of 35 landing sites in the Strait of Georgia Creel Survey area. This

sampling represents approximately 6% of the total number of boat trips conducted by sport fishers in the Strait of Georgia in 1999. A total of 41 overflights were also conducted to take "snapshot" counts of fishing effort.

Sport fishers in the Strait of Georgia landed an estimated total finfish catch of 175,855 pieces of which 44% were salmon and 56% were groundfish. The 76,808 landed salmon consisted of 43,588 chinook, 478 coho, 4,404 chum, 27,845 pink salmon and 492 sockeye salmon. Anglers released an additional 105,792 salmon of mixed species. 99,047 landed groundfish consisted of 2,489 halibut, 3,691 lingcod, 67,255 rockfish and 13,937 other finfish

Among salmon examined for adipose-clips, 4.1% of chinook and 72% of coho had adipose clips. The majority of chinook sport catches in 1999 consisted of age 3 fish (73.4%), followed by age 4 fish (21.4%), age 5+ (4.9%) and age 2 fish (0.3%). Of the total chinook measured in 1999, less than 1% were sub-legal in size. The mean yearly size of coho was 58.7 cm, which is a 9.7 cm increase from 1998, however only 51 fish were sampled.

PART 2

NORTHERN VANCOUVER ISLAND

INTRODUCTION

Part 2 of this report documents the 1999 catch and effort statistics for the Northern Vancouver Island sport fishery. The Northern Vancouver Island access point creel survey follows the methodology of the Strait of Georgia creel survey for objectives, study design, data collection and data analysis. The following text contains only the differences between the two creel surveys. The last published report (1999) for the Northern Vancouver Island was for 1998. A list of previous reports in this series may be found in Appendix A. In this report all tables, figures and appendices are located at the end of the text.

BACKGROUND

The study area is located on the north-eastern coast of Vancouver Island (Fig. 21), consisting of Queen Charlotte and Johnstone Straits. The area is approximately 80 km wide by 110 km long, the creel survey study area was divided into 4 sub areas, 12A to 12D. The major fishing areas include Gordon Channel, Hardy Bay, Broughton Strait, Blackfish Sound, Baronet Passage, Knight Inlet, Tribune Channel, and Sutlej Channel. Statistical sub area 12E was not covered in 1999 due to the cost of an isolated access point and extended float plane over flights for boat counts. In 1998, 12E contained only 10% of the total effort for Area 12 and 7% of the total finfish catch (Hardie et al. 1999).

The 1999 creel survey ran from July to mid September. The most sought after species in the Northern Vancouver Island recreational fishery was the chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon, but with the closure of coho (1998), pink (*O. gorbuscha*) salmon has replaced coho as a primary target species. Significant fisheries are also directed at sockeye (*O. nerka*), rockfish (*Sebastes spp.*) and halibut (*Hippoglossus stenolepis*).

The 1999 creel survey showed an increase over 1998 in estimated fishing effort of 138% from 16,408 boat trips (1998) to 39,151 in 1999 (Table 21). All catches increased as well, 7,813 chinook, 52,359 pink salmon, 6,713 halibut and an additional 34,829 released coho (Table 21). The 1998 creel survey estimated 2,366 chinook, 15,004 pink, 3,652 halibut and 30,857 released coho (Hardie et al. 1999).

OBJECTIVES

The objectives of the 1999 Northern Vancouver Island creel survey are contained in Part 1 Strait of Georgia objectives.

METHODS

STUDY DESIGN

The design of the 1999 Northern Vancouver Island Creel Survey was similar to that used for the 1999 Strait of Georgia Creel Survey, with some modifications to the data analysed, sampling intensity, flight routes and data processing.

The fishery was stratified according to the following criteria:

1. Month. The survey operated from July through to mid-September.
2. Geographic area. Catch and effort estimates were produced for statistical sub-areas 12A to 12D (Fig. 21).
3. Day type. Weekend and mid-week days were considered independently because sport fishing activity is known to differ for the two types of days.
4. Time of day. Sampling shifts (one shift is a set number of consecutive hours of interviewing anglers at one site by one creel surveyor) were conducted during set time periods. From June to September sampling was conducted during either an early shift (approximately 0700 to 1500 hours) or a late day shift (approximately 1500 to 2300 hours).
4. Guided versus unguided anglers. Certain sites are known to have primarily guided fishing effort. Unpublished data from previous surveys in this series confirm that the CPUE from guided boats differs markedly from unguided boats. Effort was made to document guided vs. unguided; however the catch estimate program has no allowances for guided versus non-guided.

Allocation of sampling effort among months followed the same general pattern as fishing effort (Fig. 22), that is, more effort was allocated during August when fishing effort is at its highest. Shifts were divided equally among weekend and mid-week days and early and late daily time periods.

F.O.C conducted data collection, data entry, preliminary processing and generated estimations of the catch and effort statistics.

DATA COLLECTION

Angler Interviews

Surveyors were stationed at access points for scheduled shifts to interview anglers as they returned from fishing. For each boating party landing, the following questions were asked and information was recorded (Fig. 23).

In 1999, interviews were conducted each month at six sites, Echo Bay, Telegraph Cove, Alder Bay, the public ramp and the Quarterdeck Marina in Port Hardy and the Port McNeill ramp. For each area - day type - work block stratum, sampling shifts at a site were chosen on a near random basis from the total number of shifts available. For definition of the above terms (day type, work block, shift) see Appendix C.

Two main sources of potential bias may exist for this survey: non-representative sampling and analytical method. All of the high volume access points were identified and sampled through this survey to minimise the potential of non-representative sampling bias. Some active remote resorts (Farewell Harbour Resort, Double Bay Resort) in the Blackfish Sound area were not sampled for logistical reasons, however, the fishery in this area was represented through data collected at Telegraph Cove and Alder Bay sites. Potential bias occurs through analytical methodology when access point data cannot be highly associated with a specific sub-area (or sub-area group). For this survey access point data and sub-areas were associated using mapping analysis which indicated a very high degree of association for each site sub-area used minimising the potential for bias from this source. Fishing interviews from landings to the Quarterdeck Marina and public ramp in Port Hardy showed that 99% of the fishing activity occurred in sub-area 12A. Landings at Telegraph Cove showed 55% activity in sub-area 12C and 22% activity in sub-areas 12B and 12D. Fishing activity in Alder Bay was split with 47% in sub-area 12C and 37% in sub-area 12B. Port McNeill showed 58% fishing activity from sub-area 12B.

Aerial Overflights

Aerial surveys, conducted from airplanes travelling along pre-defined 440 km route (Fig. 24), allowed observers to count vessels actively sport fishing throughout the Northern Vancouver Island. Twelve flights were conducted in 1999.

DATA ANALYSIS

Methods and equations are contained in Appendix C.

RESULTS

DISTRIBUTION OF SAMPLING EFFORT

A total of 4,511 interviews, of which 3,223 involved actively fishing anglers, and 12 overflights were conducted in 1999. The monthly distribution of interviews generally reflected the monthly distribution of fishing effort (Table 22, Fig. 24). The total interviews represent 11.5% of the estimated total fishing effort (39,151 boat trips) for the entire study area (Table 21). The interviews involving actively fishing anglers represent 8.2% of the total fishing effort.

SPORT FISHING EFFORT AND CATCH

The 1999 Northern Vancouver Island sport fishing catch and effort statistics are summarised for each species by month (Tables 22, 24, 26, 28 and 30) and by statistical area (Tables 23, 25, 27, 29, 31). Appendix I and J give catch and effort by month and statistical sub-area.

Angler effort increased in 1999 by 138% from 16,408 boat trips in 1998, to 39,151 boat trips in 1999. Fishing effort followed last years trend, levels climbed steadily from July, peaked in August and declined in September (Fig. 22).

The total finfish sport catch in the Northern Vancouver Island was estimated at 91,001 pieces, including steelhead and cutthroat trout (Table 21) and consisted of 69% salmon and 31% groundfish. Anglers released an additional 41,673 chinook and coho salmon.

The only significant sport fishing regulation changes in 1999 were the closures of large areas of the West Coast of Vancouver Island, July 15 and August 1, 2000 (Appendix F).

General restrictions were:

1. Only barbless hooks were to be used when fishing for salmon, through out the coast.
2. The non-retention of coho in all B. C. tidal and non- tidal waters with the exceptions of a few selected terminal fisheries such as the mouth of the Capilano River (Statistical Area 28) and a portion of Sechelt Inlet (Area 16). Coho daily limits were 2 with a possession limit of 4; minimum size was 41 cm.
3. There were area closures on sockeye salmon.

General regulations were minimum size limit for chinook of 62 cm, with a daily limit of 2, possession of 4, and an annual limit of 15 for the Strait of Georgia (Cape Sutil to Cadboro Bay; Appendix G for a historical synopsis of regulation changes).

Salmon

Salmon sport catches for the Northern Vancouver Island increased 236% from 18,660 in 1998 to 62,743 pieces in 1999 (Table 21). The catch consisted of 12% chinook, 1% chum, 83% pink, 2% sockeye salmon.

In 1999, anglers kept 7,813 chinook, 607 chum, 52,359 pink and 1,538 sockeye salmon (Tables 22 and 23, and Fig. 26). Coho remained closed to retention, yet an estimated 430 were kept in 1999. The average catch efficiency varied, chinook at 0.20, chum 0.02, pink 1.34 and sockeye at 0.04 (Table 32). The average boat trip caught 1.60 salmon, as compared to 1.14 in 1998. August was the peak month for fishing with a CPUE of 2.21 (Table 32, Fig. 26).

The spatial distribution of salmon catch showed a predictable pattern. The highest effort and catches were taken in sub-areas 12B and followed by sub-areas 12A and 12C. Sub-area 12B had 65% of the total effort and 12A had 17% and 12C had 16% of the total fishing effort (Table 23, 25, 27, 29 and 31). Total salmon caught consisted of 12B containing 64% and 12A containing 19% of the catch. Appendix I shows salmon catch and effort by month and sub-area.

The non-retention of coho for the 1999 sport fishing season continues to alter the catch estimates. Previously a significant coho fishery occurred in the Northern Vancouver Island with 25,873 retained in 1993 (access point survey April to the end of August). In 1999, anglers released 34,829 coho, sub-area 12B had 66% of the released total (Table 22 and 23). While the salmon catches increased 236% in 1999, the catch and release of coho only increased 12.9% from 30,857 in 1998 (Table 21).

Groundfish

The 1999 Northern Vancouver Island catch consisted of 28,402 groundfish, which made up 31% of the overall catch. The species composition of the groundfish catch, based on the Tables 24, 26 and 30 data, is as follows:

Groundfish Species	Catch	% of Total Groundfish Catch	Major Catch Area
Halibut (<i>Hippoglossus stenolepis</i>)	6,713	24%	12B
Lingcod (<i>Ophiodon elongatus</i>)	2,056	7%	12B
Rockfish (<i>Sebastes</i> spp.)	19,354	68%	12B
Other Finfish (Tables 24, 26 and 30)	279	1%	
	28,402	100%	

The majority of the groundfish catch was taken during August, reflecting the peak fishing effort of the summer (Tables 24, 26, 28 and 30, Fig. 22). Catch by Statistical sub-area for all groundfish was highest in 12B (Tables 25, 27 and 31). Appendix I shows groundfish catch and effort by month and sub-area.

Rockfish species were identified for the entire survey area in 1999, catch and release estimates were generated for nine species (Tables 26, 27, 28 and 29). The major catches are shown below. The "other" rockfish category consists of canary (*Sebastes pinniger*), china (*S. nebulosus*), redstripe (*S. proriger*), tiger (*S. nigrocinctus*) and unidentified species.

Rockfish Species	Catch	% of Total Rockfish Catch	Major Catch Area
Black (<i>Sebastes melanops</i>)	2,747	14.2%	12B
Copper (<i>Sebastes caurinus</i>)	1,345	6.9%	12B
Quillback (<i>Sebastes maliger</i>)	6,827	35.3%	12B
Yelloweye (<i>Sebastes ruberrimus</i>)	3,535	18.3%	12B
Yellowtail (<i>Sebastes flavidus</i>)	2,557	13.2%	12B
Other	2,343	12.1%	12B
	19,354	100.0%	

In addition to the catch of 19,354 rockfish, 6,882 rockfish were released by anglers, of which 33% were Quillback (Tables 28 and 29).

The CPUE for rockfish was relatively constant throughout the creel survey period and averaged 0.49, while the CPUE for halibut was 0.17 and lingcod was 0.05 (Table 32). The CPUE for all total finfish during 1999 was 2.32 (Table 32).

BIOLOGICAL DATA

Percentage and Catch of Adipose-clipped Chinook and Coho

In 1999, 499 chinook were examined for adipose-clips (Tables 33). Among chinook examined, 3.6% had adipose clips. A total catch of 302 clipped chinook was estimated for Northern Vancouver Island in 1999 (Table 34).

Catch-At-Age for Chinook

During 1999, 478 chinook biological samples were collected for age and length analysis. Table 35 shows the monthly number and percent age composition of chinook sampled for age. All ages shown in this report represent the saltwater age. The age data are summarised graphically in Figure 27. The monthly age percentages were applied to the estimated monthly chinook catches to provide a breakdown by age group (Table 36).

In 1999, the chinook sport catch in Northern Vancouver Island consisted primarily of age 4 fish (53.3%), followed by age 3 fish (36.5%) and age 5+ (10.2%) (Table 36). Age 4 fish were the dominant component of the catch throughout the year with age 3 fish primarily making up the remainder of the catch (Tables 35 and 36).

Mean Length-At-Age for Chinook

Table 37 shows the monthly mean nose-fork length at age for the 478 chinook for which both length and age data were available. Figure 28 shows the length frequency distribution for all the measured chinook. The overall mean length for age 3 fish was 75.0 cm, age 4 fish was 84.7 cm and age 5 fish was 89.9 cm (Table 37). Three age 6 fish were sampled in 1999, their average size was 92.0 cm (Table 37).

SUMMARY

A sport fishery creel survey was conducted in the Northern Vancouver Island in 1999 to estimate the catches of all the important recreational finfish species and the total sport fishing boat trips. In the report, data are presented by both month and statistical sub-area. From the catch and effort estimates CPUE could be calculated.

Although there were significant sport fishing regulation changes in 1998, which affected catch and effort, the downward trend in fishing effort and catch of the main target species of chinook and pink halted in 1999. Fishing effort increased 140% from 16,408 (1998) to 39,151 (1999). Total salmon catch also increased dramatically by 236% from 18,660 (1998) to 62,743 in 1999.

Sport fishers made an estimated 39,151 boat trips in the Northern Vancouver Island. A total of 4,511 boating parties, of which 3,223 were actively fishing, were interviewed at six landing sites in the Northern Vancouver Island creel survey area. This sampling represents approximately 8.2% of the total number of boat trips conducted by sport fishers in the Northern Vancouver Island. A total of 12 overflights were also conducted.

Sport fishers in the Northern Vancouver Island landed an estimated total finfish catch of 91,145 pieces of which 69% were salmon and 31% were groundfish. The 62,743 landed salmon consisted of 7,813 chinook, 607 chum, 52,359 pink salmon and 1,538 sockeye salmon. Anglers released an additional 6,844 chinook and 34,829 coho salmon. CPUE averaged 1.60 for salmon (all species), 0.73 for groundfish and 2.32 for total finfish. The 28,402 landed groundfish consisted of 6,713 halibut, 2,056 lingcod, 19,354 rockfish and 279 other finfish.

Among chinook salmon examined 3.6% had adipose clips. The majority of chinook sport catches in 1999 consisted of age 3 fish (73.4%), followed by age 4 fish (21.4%), age 5+ (4.9%) and age 2 fish (0.3%). The mean annual length of chinook at age 3 was 75.0 cm, age 4 was 84.7 cm and age 5 was 89.9 cm.

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TABLES

Table 1. Number of fishing interviews by month and Statistical Area and number of overflights by month for the Strait of Georgia Creel Survey, 1999.

Month	13	14	15	Statistical Area				18	19	28	29	Total	Over Flights
				16	17	18	19						
Apr	88	48		58	53	20	186			26	30	509	4
May	87	105	3	93	194	22	183			44	43	774	5
Jun	215	267	14	187	472	17	214			55	39	1480	6
Jul	462	428	22	224	452	40	648			79	65	2420	8
Aug	442	442	18	115	338	80	743			16	137	2331	6
Sep	487	342	5	50	105	123	226			13	129	1480	6
Oct	196	21	0	0	0	0	0			0	0	217	6
Total	1977	1653	62	727	1614	302	2200			233	443	9211	41

Table 2. Tidal effort estimates and sport catches for the Strait of Georgia, 1983 to 1999. (This table uses values from April up to and including September for historical comparisons. See Appendix E-1 for total effort and catch estimates for 1980 to 1999. See Appendix E-2 for historical effort and catch estimates from 1960 to 1980).

Year	Effort	Salmon Catch*				Total Salmon	Salmon Released				Groundfish Catch			
		Chum	Coho	Pink	Sockeye		All Chinook	All Coho	All Salmon	Halibut	Lingcod	Rockfish	Dogfish	Other
1983	495756	0**	382905	53129	0**	592546	0**	0**	633444	0**	68170	183493	4226	62662
1984	595998	0	432535	10080	0	778403	0	0	575704	0	129550	144174	4552	69194
1985	576885	0	715061	90498	0	1015445	0	0	839402	0	73957	121881	4336	46392
1986	523272	613	550726	3138	873	710391	0	0	111346	0	67126	152391	5108	52333
1987	525047	682	621749	89833	8491	822645	0	0	949611	0	60752	121297	3810	39100
1988	590389	663	1042504	8692	16273	1160361	0	0	813689	0	61565	174709	3669	54775
1989	532968	3329	472627	122859	13345	717364	181537	0	1090925	0	46225	176380	3504	30639
1990	497550	652	602352	11549	30606	741051	187554	0	638406	0	31092	142797	2259	24622
1991	409376	888	126852	248976	23401	502140	153687	0	545160	0	8116	150524	3324	17532
1992	422088	843	571459	19077	6745	698645	143967	0	370783	0	5733	124339	1677	27109
1993	480747	1766	823694	172713	23600	1163190	172690	0	507602	0	6756	98134	1893	30240
1994	423622	289	278890	18453	14038	383031	136863	0	375805	0	6793	149668	1244	31888
1995	306849	1481	73080	183859	5897	328628	109868	0	303500	0	4743	107379	1873	26886
1996	289423	3474	127890	7887	2419	233469	180238	0	366379	0	3733	102818	1497	39786
1997	258280	481	98553	111003	16819	285533	63951	0	375728	0	4009	85701	2528	51380
1998	158559	3556	1376	6848	4474	37994	34294	20570	2340	2125	3283	81591	0**	43404
1999	161316	791	315	26456	492	71614	60022	13022	101384	2489	3691	65681	0	13793

*Catch and effort estimates: 1983 to 1992 from prior annual reports (see Appendix A), 1993 to 1999 from unpublished creel survey data.

** A zero in a species column indicates that no catch estimates were generated for that species for that year.

Table 4. Salmon catches and effort by species and Statistical Area for the Strait of Georgia, 1999

Area	Effort (Boat Trips)	Salmon Catch							Salmon Released							
		Chinook	Chum	Coho	Pink	Sockeye	Total Salmon	Legal Chinook	Sub-legal Chinook	Legal Coho	Sub-legal Coho	Chum	Pink	Sockeye	Total Salmon	
13	Total	34907	9556	4396	418	23932	142	38444	555	9311	5501	1146	96	3510	1004	36119
	STD	1989	745	737	81	3112	40	3576	100	734	559	138	40	530	169	2461
14	Total	22757	8627	0	8	567	4	9209	336	19876	263	2637	42	165	2	28728
	STD	1926	638	737	81	3113	40	3557	103	845	550	191	40	530	169	2562
15	Total	2589	701	0	5	104	0	810	61	1720	107	150	0	23	2	2371
	STD	423	123	0	4	49	0	135	23	499	53	39	0	14	2	596
16	Total	16733	4598	0	0	2	0	4600	85	5102	150	1807	1	0	0	7165
	STD	1141	829	0	0	1	0	829	32	719	69	722	1	0	0	1059
17	Total	21538	8832	0	7	29	11	8880	888	11873	146	1227	12	49	0	17891
	STD	1512	864	0	5	13	8	869	164	1053	52	190	7	33	0	1668
18	Total	9068	829	0	0	176	2	1007	0	1525	3	53	0	110	2	2231
	STD	872	157	0	0	58	2	170	0	308	3	30	0	74	2	409
19	Total	40511	8023	0	0	2898	333	11252	1124	1108	330	247	0	425	35	4030
	STD	3534	1549	0	0	578	175	1726	967	341	121	110	0	165	27	1179
28	Total	11181	1482	0	8	8	0	1498	24	4753	9	14	0	1	0	4811
	STD	1150	501	1	6	4	0	502	19	2315	7	6	0	1	1	2316
29	Total	5000	942	8	31	130	0	1110	19	2063	39	167	0	10	12	2444
	STD	616	249	9	15	49	0	270	14	690	29	77	0	9	10	710
Total		164284	43590	4404	477	27846	492	76810	3092	57331	6548	7448	151	4293	1057	105790
STD		5136	2315	737	83	3172	180	4276	991	4558	587	915	51	568	171	5980

Table 5. Groundfish catches and effort by species and month for the Strait of Georgia, 1999.

Month	Effort (Boat Trips)	Groundfish Catch						Groundfish Released							
		Halibut	Lingcod	Herring	English sole	Flounder	Other Grndfish	Total Grndfish	Halibut	Lingcod	Herring	English sole	Flounder	Other Grndfish	Total Grndfish
Apr	Total	9611	20	10	83	2278	0	2391	49	2363	0	0	0	5	2417
	STD	854	22	9	70	2002	0	2103	38	697	0	0	0	11	746
May	Total	9426	974	52	0	782	39	1847	11	1678	5	56	25	3	1778
	STD	1183	677	41	0	357	20	1095	7	363	6	50	17	4	447
Jun	Total	34973	459	583	0	410	34	2079	0	5024	0	0	34	85	5143
	STD	3396	458	124	0	278	13	369	0	920	0	0	14	65	999
Jul	Total	40168	535	1102	0	987	321	3826	110	6284	0	115	93	316	6918
	STD	1832	326	213	0	447	110	1467	82	695	0	90	63	309	1239
Aug	Total	41078	148	1061	0	171	476	1896	287	7821	13	18	455	160	8754
	STD	2283	54	206	0	88	166	538	141	1104	10	8	179	138	1580
Sep	Total	26060	353	883	0	3478	1064	5816	0	5463	0	0	31	0	5494
	STD	1965	164	549	0	3686	723	5154	0	1816	0	0	32	0	1848
Oct	Total	2966	0	0	0	0	0	0	0	490	0	0	0	0	490
	STD	538	0	0	0	0	0	0	0	172	0	0	0	0	172
Total	164282	2489	3691	83	8106	1934	17855	457	29123	18	189	638	569	30994	
STD	5136	897	637	70	4243	750	4479	168	2548	12	103	194	345	2586	

Table 7. Rockfish catches and effort by species and month for the Strait of Georgia, 1999.

		Rockfish Catch										
		Effort	Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	All Rockfish
Month												
Apr	Total	9611	0	0	582	0	1423	0	0	183	0	3563
	STD	854	0	0	183	0	448	0	0	86	0	994
May	Total	9426	51	0	764	23	2587	41	0	134	0	4928
	STD	1183	35	0	241	16	574	23	0	42	0	866
Jun	Total	34973	0	0	1412	43	4008	0	14	387	0	8114
	STD	3396	0	0	368	27	716	0	9	93	0	1226
Jul	Total	40168	14	713	1550	0	9838	0	3	858	8	15370
	STD	1832	9	298	316	0	1815	0	3	254	8	2179
Aug	Total	41078	21	84	2963	0	12715	0	140	985	0	22338
	STD	2283	9	55	511	0	1811	0	40	214	0	3828
Sep	Total	26060	111	0	1385	0	7524	22	37	337	117	11368
	STD	1965	134	0	516	0	2450	11	16	120	135	2912
Oct	Total	2966	0	0	250	0	1277	0	29	10	0	1575
	STD	538	0	0	110	0	438	0	29	10	0	540
Total		164282	197	797	8906	66	39372	63	223	2894	125	67256
		5136	139	303	931	31	3716	25	53	378	135	5605

Table 8. Rockfish catches and effort by species and Statistical Area for the Strait of Georgia, 1999.

		Rockfish Catch										All Rockfish
		Effort	Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	
Area												
13	Total	34907	0	0	3051	0	18254	45	213	765	2	23570
	STD	1989	0	0	381	0	1462	23	52	124	3	1829
14	Total	22757	0	12	549	1	1165	11	0	166	3	2486
	STD	1926	0	8	437	1	337	9	0	56	3	651
15	Total	2589	0	0	32	0	360	7	0	81	2	591
	STD	423	0	0	16	0	94	7	0	49	2	159
16	Total	16733	0	503	1753	63	12068	0	0	1254	0	17780
	STD	1141	0	246	489	31	2550	0	0	333	0	3163
17	Total	21538	59	0	376	0	3122	0	7	535	0	5462
	STD	1512	36	0	165	0	400	0	10	97	0	638
18	Total	9068	6	0	291	0	400	0	0	6	8	1350
	STD	696	4	0	122	0	128	0	0	0	8	299
19	Total	40511	132	274	2582	0	3435	0	3	47	111	9602
	STD	3534	134	176	469	0	2200	0	3	38	134	2629
28	Total	11181	0	0	170	0	77	0	0	0	0	5403
	STD	1150	0	0	153	0	70	0	0	0	0	3184
29	Total	5000	0	10	99	2	491	0	0	40	0	1011
	STD	616	0	6	47	2	167	0	0	20	0	244
Total		164284	197	799	8903	66	39372	63	223	2894	126	67255
STD		5136	139	303	931	31	3716	26	53	378	134	5605

Table 9. Rockfish released and effort by species and month for the Strait of Georgia, 1999.

Month		Effort	Rockfish Released									All Rockfish
			Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	
Apr	Total	9611	0	0	0	0	72	0	0	0	0	2033
	STD	854	0	0	0	0	66	0	0	0	0	431
May	Total	9426	0	0	0	0	154	0	0	0	0	2249
	STD	1183	0	0	0	0	245	0	0	0	0	527
Jun	Total	34973	0	0	0	0	31	0	0	15	0	8658
	STD	3396	0	0	0	0	23	0	0	11	0	1359
Jul	Total	40168	0	13	92	0	528	0	0	82	0	11358
	STD	1832	0	9	47	0	237	0	0	48	0	1316
Aug	Total	41078	0	24	123	0	490	0	0	46	6	11272
	STD	2283	0	17	50	0	145	0	0	53	5	1484
Sep	Total	26060	0	89	0	0	40	0	0	0	0	4126
	STD	1965	0	34	0	0	34	0	0	0	0	1575
Oct	Total	2966	0	0	0	0	0	0	0	0	0	231
	STD	538	0	0	0	0	0	0	0	0	0	90
Total		164282	0	126	215	0	1315	0	0	143	6	39927
STD		5136	0	39	69	0	378	0	0	72	5	2955

Table 10. Rockfish released and effort by species and Statistical Area for the Strait of Georgia, 1999.

Area		Effort	Rockfish Released									All Rockfish
			Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	
13	Total	34907	0	11	0	0	380	0	0	0	0	10695
	STD	1989	0	8	0	0	122	0	0	0	0	957
14	Total	22757	0	26	0	0	236	0	0	47	0	3298
	STD	1926	0	14	0	0	213	0	0	43	0	810
15	Total	2589	0	3	0	0	26	0	0	0	0	241
	STD	423	0	3	0	0	20	0	0	0	0	74
16	Total	16733	0	21	0	0	234	0	0	0	0	6720
	STD	1141	0	18	0	0	254	0	0	0	0	1454
17	Total	21538	0	24	0	0	309	0	0	38	0	8636
	STD	1512	0	20	0	0	119	0	0	22	0	1031
18	Total	9068	0	32	22	0	34	0	0	46	0	2661
	STD	872	0	22	16	0	25	0	0	53	0	606
19	Total	40511	0	7	193	0	96	0	0	12	6	6795
	STD	3534	0	8	66	0	57	0	0	11	5	1886
28	Total	11181	0	0	0	0	0	0	0	0	0	389
	STD	1150	0	0	0	0	0	0	0	0	0	211
29	Total	5000	0	0	0	0	0	0	0	0	0	493
	STD	616	0	0	0	0	0	0	0	0	0	132
Total		164284	0	124	215	0	1315	0	0	143	6	39928
STD		5136	0	39	68	0	378	0	0	73	5	2956

Table 11. Other catches and effort by species and month for the Strait of Georgia, 1999

Month	Effort	Other Catch				Other Released			
		Mackeral	Unident	Total	Shellfish	Mackeral	Unident	Total	Shellfish
				Other				Other	
Apr	Total	9611	0	786	786	11635	0	1788	2462
	STD	854	0	252	252	7132	0	806	1266
May	Total	9426	0	689	689	1537	6	778	2369
	STD	1183	0	159	159	628	8	346	1083
Jun	Total	34973	0	1357	1453	7017	11	2577	10692
	STD	3396	0	402	410	3737	8	694	2790
Jul	Total	40168	0	3016	3053	4731	0	5107	20135
	STD	1832	0	635	636	1072	0	1242	2721
Aug	Total	41078	19	2780	2903	2607	22	3399	20278
	STD	2283	12	501	504	568	13	2036	2937
Sep	Total	26060	0	4817	4909	4897	0	2188	9317
	STD	1965	0	1803	1805	1508	0	1391	2682
Oct	Total	2966	0	144	144	0	0	55	55
	STD	538	0	57	57	0	0	34	34
	Total	164282	19	13589	13937	32424	39	15892	65308
	STD	5136	12	2039	2044	8305	17	2979	5812

Table 12. Other catches and effort by species and Statistical Area for the Strait of Georgia, 1999

Area	Effort	Other Catch				Other Released			
		Mackeral	Unident	Total	Shellfish	Mackeral	Unident	Total	Shellfish
				Other				Other	
13	Total	34907	3	2485	2587	6899	6	2488	15603
	STD	1989	3	287	294	3816	8	500	1263
14	Total	22757	0	655	655	661	0	331	4818
	STD	1926	0	261	261	439	0	102	744
15	Total	2589	7	113	120	150	0	91	403
	STD	423	7	71	73	96	0	25	143
16	Total	16733	10	5641	5651	11105	0	1660	19006
	STD	1141	10	1559	1559	7129	0	419	3661
17	Total	21538	0	209	236	2771	33	418	2932
	STD	1512	0	69	70	759	15	150	348
18	Total	9068	0	211	243	2059	0	313	2514
	STD	872	0	101	103	381	0	125	1022
19	Total	40511	0	3913	4029	8440	0	6986	15477
	STD	3534	0	1243	1246	1624	0	2021	3545
28	Total	11181	0	32	32	81	0	2867	2978
	STD	1150	0	20	20	52	0	2067	2091
29	Total	5000	0	327	382	259	0	738	1575
	STD	616	0	111	134	110	0	193	311
	Total	164284	20	13586	13935	32425	39	15892	65306
	STD	5136	13	2039	2043	8304	17	2978	5812

Table 13. Monthly CPUE (catches per boat trip) by species for the Strait of Georgia, 1999*.

Month	Salmon Catch					Total Salmon	Salmon Released			Groundfish Catch			Total Catch Success	
	Chinook	Coho	Chum	Pink	Sockeye		Chinook	Coho	Other Salmon	Halibut	Lingcod	Rockfish		Other
Apr	0.19	0.00	0.00	0.00	0.00	0.19	0.36	0.01	0.39	0.00	0.00	0.37	0.08	0.64
May	0.28	0.00	0.00	0.00	0.00	0.28	0.32	0.01	0.34	0.10	0.01	0.52	0.07	0.98
Jun	0.37	0.00	0.00	0.00	0.00	0.37	0.26	0.02	0.29	0.01	0.02	0.23	0.04	0.67
Jul	0.28	0.00	0.00	0.02	0.01	0.30	0.27	0.06	0.44	0.01	0.03	0.38	0.08	0.80
Aug	0.27	0.00	0.00	0.12	0.00	0.40	0.63	0.14	1.08	0.00	0.03	0.54	0.07	1.04
Sep	0.15	0.01	0.03	0.79	0.00	0.98	0.28	0.16	0.85	0.01	0.03	0.44	0.19	1.65
Oct	0.01	0.05	1.22	0.47	0.00	1.75	0.14	0.33	1.49	0.00	0.00	0.53	0.05	2.33
Yearly	0.27	0.00	0.03	0.17	0.00	0.47	0.37	0.09	0.64	0.02	0.02	0.41	0.08	1.00

* Calculated using Tables 3, 5, 7 and 11 data.

Table 14. Number of adipose-clipped chinook observed by month and Region for the Strait of Georgia, 1999.

Month		North Gulf	South Gulf	Victoria	Total
Apr	Unclipped	41	34	22	97
Apr	Clipped	7	2	6	15
Apr	Total	48	36	28	112
May	Unclipped	83	169	16	268
May	Clipped	2	2		4
May	Total	85	171	16	272
Jun	Unclipped	223	290	36	549
Jun	Clipped	14	18		32
Jun	Total	237	308	36	581
Jul	Unclipped	439	172	112	723
Jul	Clipped	5	5	3	13
Jul	Total	444	177	115	736
Aug	Unclipped	341	110	97	548
Aug	Clipped	20	6	2	28
Aug	Total	361	116	99	576
Sep	Unclipped	193	76	4	273
Sep	Clipped	7	4	1	12
Sep	Total	200	80	5	285
Oct	Unclipped	2			2
Oct	Clipped				
Oct	Total	2			2
Total	Unclipped	1322	851	287	2460
	Clipped	55	37	12	104
	Total	1377	888	299	2564
Proportion of Clips		0.040	0.042	0.040	0.041

Table 15. Monthly estimated catches of adipose-clipped chinook by Region for the Strait of Georgia, 1999*.

Month		North Gulf	South Gulf	Victoria	Total
Apr	Catch	114	35	85	235
	STD	52	26	57	81
May	Catch	15	16	0	32
	STD	11	13	0	18
Jun	Catch	209	312	0	520
	STD	64	85	0	107
Jul	Catch	81	65	44	190
	STD	37	31	27	55
Aug	Catch	476	75	22	574
	STD	114	32	17	120
Sep	Catch	94	48	40	182
	STD	40	27	52	71
Oct	Catch	0	0	0	0
	STD	0	0	0	0
Total	Catch	990	551	191	1733
	STD	136	92	112	198

* Calculated using data from Table 14 and Appendix D-2.

Table 16. Monthly number of adipose-clipped coho observed by Region for the Strait of Georgia, 1999.

Month		North Gulf	South Gulf	Victoria	Total
Apr					
May					
Jun	Unclipped		1		1
	Clipped		0		0
	Total		1		1
Jul	Unclipped	1	1	1	3
	Clipped	0	0	0	0
	Total	1	1	1	3
Aug	Unclipped		1	3	4
	Clipped		6	1	7
	Total		7	4	11
Sep	Unclipped	4	0		4
	Clipped	17	2		19
	Total	21	2		23
Oct	Unclipped	2			2
	Clipped	11			11
	Total	13			13
Total	Unclipped	7	3	4	14
	Clipped	28	8	1	37
	Total	35	11	5	51
Proportion of Marks		0.800	0.727	0.200	0.725

Table 17. Origin of coded-wire tagged chinook caught in the Strait of Georgia, 1999.

Species	River	Prov/State	Number	Percent
Chinook	CONUMA R	BC	1	0.3%
Chinook	DOME CR	BC	1	0.3%
Chinook	QUESNEL R	BC	1	0.3%
Chinook	SALMON R/TOMF	BC	1	0.3%
Chinook	NICOLA R	BC	2	0.5%
Chinook	PORTAGE BAY STOCK UW	BC	2	0.5%
Chinook	SHUSWAP R	BC	13	3.5%
Chinook	LTL QUALICUM R	BC	5	1.3%
Chinook	QUINSAM R	BC	5	1.3%
Chinook	PUNTLEDGE R	BC	6	1.6%
Chinook	PORTEAU COVE	BC	12	3.2%
Chinook	BIG QUALICUM R	BC	13	3.5%
Chinook	LANG CR	BC	16	4.3%
Chinook	HARRISON R	BC	17	4.6%
Chinook	NANAIMO R	BC	21	5.6%
Chinook	COWICHAN R	BC	39	10.5%
Chinook	CHILLIWACK R	BC	110	29.6%
Chinook	SACRA R, ABO FEATHER	CA	1	0.3%
Chinook	DESCHUTES R	OR	1	0.3%
Chinook	MCALLISTER CR	WA	1	0.3%
Chinook	WA PROD AREA NOOK	WA	1	0.3%
Chinook	WHITE R	WA	1	0.3%
Chinook	BIG SOOS CR	WA	3	0.8%
Chinook	STILLAGUAMISH R	WA	4	1.1%
Chinook	GEORGE ADAMS (PURDY)	WA	5	1.3%
Chinook	GROVERS CR	WA	6	1.6%
Chinook	NISQUALLY R	WA	6	1.6%
Chinook	FINCH CR	WA	9	2.4%
Chinook	SAMISH (FRIDAY CR)	WA	9	2.4%
Chinook	SKYKOMISH R	WA	9	2.4%
Chinook	NOOKSACK R	WA	17	4.6%
Chinook	SKAGIT R	WA	34	9.1%

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Table 18. Monthly number and percent age composition of chinook sampled for age in the Strait of Georgia Creel Survey, 1999.

Month	Age 2		Age 3		Age 4		Age 5		Age 6		Total Sampled
	n	%	n	%	n	%	n	%	n	%	
Apr	0	0.0%	68	84.0%	13	16.0%	0	0.0%	0	0.0%	81
May	0	0.0%	168	81.2%	38	18.4%	1	0.5%	0	0.0%	207
Jun	0	0.0%	308	74.6%	90	21.8%	15	3.6%	0	0.0%	413
Jul	1	0.2%	313	68.3%	104	22.7%	37	8.1%	3	0.7%	458
Aug	2	0.5%	266	72.3%	84	22.8%	14	3.8%	2	0.5%	368
Sep	3	1.5%	160	81.6%	29	14.8%	4	2.0%	0	0.0%	196
Oct	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Total	6		1283		358		71		5		1723
Overall age composition of catch*		0.3%		73.4%		21.4%		4.6%		0.3%	

* Overall age composition of estimated catch based on data from Table 19.

Table 19. Monthly estimated catches at age of chinook for the Strait of Georgia, 1999*.

Month		Age 2	Age 3	Age 4	Age 5	Age 6	Total
Apr	Catch	0	1522	291	0	0	1813
	STD	0	76	74	0	0	
May	Catch	0	2122	480	13	0	2614
	STD	0	74	70	13	0	
Jun	Catch	0	9642	2817	470	0	12929
	STD	0	279	263	119	0	
Jul	Catch	24	7649	2542	904	73	11193
	STD	24	244	219	143	42	
Aug	Catch	61	8065	2547	424	61	11158
	STD	43	261	244	111	43	
Sep	Catch	59	3144	570	79	0	3852
	STD	34	108	98	39	0	
Oct	Catch	0	0	0	0	0	0
	STD	0	0	0	0	0	
Total	Catch	245	33187	10215	2314	219	43559
	STD	60	478	444	220	60	
Annual Proportion		0.6%	76.2%	23.5%	5.3%	0.5%	100.0%

* Calculated by applying the total monthly chinook catch from Table 3 to the monthly age proportions from Table 18.

Table 20. Monthly mean nose-fork length (L) at age of chinook sampled in the Strait of Georgia Creel Survey, 1999.

Month	Age 2		Age 3		Age 4		Age 5		Age 6		Total	
	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n
Apr		0	66.167	66	67.385	13		0		0		79
May		0	70.4	167	78.0	38	85.0	1		0		206
Jun		0	70.8	308	76.6	90	83.9	15		0		413
Jul	47.0	1	72.3	312	79.0	103	86.8	36	96.0	3		455
Aug	59.0	2	73.2	265	81.9	84	90.0	14	111.5	2		367
Sep	65.0	3	75.4	160	84.0	29	98.8	4		0		196
Oct	.	.	.	.	.	.	.	.	.	.	.	.
Avg.	60.0	6	72.0	1278	78.9	357	87.5	70	102.2	5		1716**

*No biological data were collected for the month of October.

**Seven age records were not accompanied by lengths.

Table 22. Salmon catches and effort by species and month for Northern Vancouver Island, 1999.

Effort (Boat Trips)		Salmon Catch					Salmon Released									
		Chinook		Chum	Coho	Pink	Sockeye	Total Salmon	Legal Chinook	Sub-legal Chinook	Legal Coho	Sub-legal Coho	Chum	Pink	Sockeye	Total
Month	Value	12088	2822	126	39	3978	250	7213	104	2663	3442	1263	0	552	28	8069
	Jul	STD	1799	421	33	17	704	54	1144	36	444	591	208	0	125	18
Aug	Total	20355	4437	481	391	38420	1288	45014	202	2287	14658	3241	46	3244	1289	24976
	STD	2675	640	85	101	5188	169	5969	61	359	2245	465	20	473	252	3473
Sep	Total	6708	554	0	0	9961	0	10516	0	1588	8311	3914	0	2974	0	16788
	STD	408	154	0	0	1121	0	1139	0	527	1145	908	0	799	0	2030
Total	39151	7813	607	430	52359	1538	62743	306	6538	26411	8418	46	6770	1317	49833	
	STD	3249	781	92	102	5354	177	6183	70	777	2589	1041	20	937	253	4203

Table 23. Salmon catches and effort by species and Statistical Sub-Area for Northern Vancouver Island, 1999.

Effort		Salmon Catch					Salmon Released									
Area	Value	Trips	Chinook	Chum	Coho	Pink	Sockeye	Total	Legal	Sub-legal	Legal	Sub-legal	Chum	Pink	Sockeye	Total
									Chinook	Chinook	Coho	Coho				Salmon
12A	Total	6697	1385	113	85	9994	286	11861	55	1041	4804	1142	8	1190	277	8522
	STD	1369	327	31	34	2273	58	2636	23	257	1009	221	5	247	99	1624
12B	Total	25396	4993	379	265	33244	963	39843	194	4335	17207	5733	29	4504	799	32819
	STD	2923	701	84	93	4823	163	5565	65	719	2365	987	19	893	229	3839
12C	Total	6328	1284	105	75	8361	263	10088	52	1027	3955	1446	8	954	227	7675
	STD	342	104	19	22	482	39	550	16	139	296	248	5	141	43	528
12D	Total	730	151	10	5	760	26	951	5	135	445	97	1	122	14	817
	STD	142	34	2	2	66	5	97	2	37	57	20	0	25	3	113
12	Total	39151	7813	607	430	52359	1538	62743	306	6538	26411	8418	46	6770	1317	49833
	STD	3249	781	92	102	5354	177	6183	70	777	2589	1041	20	937	253	4203

Table 24. Groundfish catches and effort by species and month for Northern Vancouver Island, 1999.

Month	Value	Trips	Groundfish Catch						Groundfish Released									
			Effort (Boat)		Groundfish				Effort (Boat)		Groundfish							
			Halibut	Lingcod	Herring	English sole	Flounder	Other Grmdfish	Total Grmdfish	Halibut	Lingcod	Herring	English sole	Flounder	Other Grmdfish	Total Grmdfish		
Jul	Total	12088	3681	628	0	0	0	9	110	4428	337	1420	0	0	0	77	1834	
	STD	1799	559	122	0	0	0	6	40	574	70	307	0	0	0	29	316	
Aug	Total	20355	2436	947	0	0	0	0	17	3400	182	977	0	0	0	56	1215	
	STD	2675	348	146	0	0	0	0	10	378	55	209	0	0	0	27	218	
Sep	Total	6708	596	481	0	0	0	0	0	1077	0	402	0	0	0	0	402	
	STD	408	182	129	0	0	0	0	0	223	0	122	0	0	0	0	122	
	Total	39151	6713	2056	0	0	0	9	127	8905	519	2799	0	0	0	133	3451	
	STD	3249	684	230	0	0	0	6	41	722	89	391	0	0	0	40	403	

Table 25. Groundfish catches and effort by species and Statistical Sub-Area for Northern Vancouver Island, 1999.

Effort (Boat Trips)			Groundfish Catch					Groundfish Released									
			Halibut	Lingcod	Herring	English sole	Flounder	Other Grndfish	Total Grndfish	Halibut	Lingcod	Herring	English sole	Flounder	Other Grndfish	Total Grndfish	
12A	Total	6697	1108	347	0	0	0	1	17	1473	85	433	0	0	0	20	538
	STD	1369	280	72	0	0	0	1	9	290	31	110	0	0	0	12	115
12B	Total	25396	4386	1349	0	0	0	6	84	5825	337	1849	0	0	0	86	2272
	STD	2923	611	215	0	0	0	6	39	649	81	366	0	0	0	37	377
12C	Total	6328	1051	318	0	0	0	2	22	1393	84	448	0	0	0	25	557
	STD	342	112	39	0	0	0	2	9	119	19	78	0	0	0	8	81
12D	Total	730	168	42	0	0	0	0	4	214	13	69	0	0	0	2	84
	STD	142	46	9	0	0	0	0	2	47	5	21	0	0	0	2	21
12	Total	39151	6713	2056	0	0	0	9	127	8905	519	2799	0	0	0	133	3451
	STD	3249	684	230	0	0	0	6	41	722	89	391	0	0	0	40	403

Table 26. Rockfish catches and effort by species and month for Northern Vancouver Island, 1999.

		Rockfish Catch, kept										
		Effort (Boat Trips)	Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	All Rockfish
Month	Value											
Jul	Total	12088	560	188	578	39	2709	0	35	1373	332	6034
	STD	1799	124	51	140	17	474	0	18	237	97	999
Aug	Total	20355	1196	844	552	0	3673	59	33	1586	1167	9657
	STD	2675	195	159	121	0	515	30	16	220	278	1219
Sep	Total	6708	991	163	215	0	445	21	0	576	1058	3663
	STD	408	403	65	110	0	144	24	0	201	287	764
	Total	39151	2747	1195	1345	39	6827	80	68	3535	2557	19354
	STD	3249	464	180	215	17	715	38	24	381	411	1752

Table 27. Rockfish catches and effort by species and Statistical Sub-area for Northern Vancouver Island, 1999.

		Rockfish Catch, kept										
		Effort (Boat Trips)	Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	All Rockfish
Area	Value											
12A	Total	6697	449	232	204	4	1157	16	10	590	435	3266
	STD	1369	106	64	54	3	258	11	6	123	127	626
12B	Total	25396	1836	756	886	27	4393	51	44	2313	1694	12622
	STD	2923	445	164	203	16	655	35	23	354	384	1615
12C	Total	6328	406	186	226	7	1137	12	13	553	391	3084
	STD	342	76	35	45	4	119	8	6	67	72	252
12D	Total	730	56	21	29	1	140	1	1	79	37	382
	STD	142	15	5	9	1	35	1	1	18	9	77
12	Total	39151	2747	1195	1345	39	6827	80	68	3535	2557	19354
	STD	3249	464	180	215	17	715	38	24	381	411	1752

Table 28. Rockfish released and effort by species and month for Northern Vancouver Island, 1999.

Month	Value	Effort (Boat Trips)	Rockfish Catch, released									All Rockfish
			Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	
Jul	Total	12088	31	38	0	0	823	0	0	127	53	2035
	STD	1799	13	16	0	0	293	0	0	58	28	431
Aug	Total	20355	36	0	59	0	1421	0	0	14	668	3653
	STD	2675	26	0	45	0	473	0	0	9	305	877
Sep	Total	6708	0	0	0	0	0	0	0	0	108	1194
	STD	408	0	0	0	0	0	0	0	0	86	586
Total			39151	67	38	59	0	2244	0	0	141	6882
STD			3249	29	16	45	0	556	0	0	59	1140

Table 29. Rockfish released and effort by species and Statistical Sub-area for Northern Vancouver Island, 1999.

Area	Value	Effort (Boat Trips)	Rockfish Catch, released									All Rockfish
			Black	Canary	Copper	China	Quillback	Redstripe	Tiger	Yellow eye	Yellow tail	
12A	Total	6697	13	7	14	0	380	0	0	17	149	1178
	STD	1369	11	6	17	0	145	0	0	12	84	319
12B	Total	25396	42	25	35	0	1435	0	0	94	530	4477
	STD	2923	26	14	40	0	518	0	0	56	296	1066
12C	Total	6328	11	5	10	0	381	0	0	26	136	1087
	STD	342	7	3	10	0	139	0	0	14	80	242
12D	Total	730	1	1	0	0	48	0	0	4	14	140
	STD	142	1	1	0	0	19	0	0	3	8	38
12 Total			39151	67	38	59	0	2244	0	0	141	6882
STD			3249	29	16	45	0	556	0	0	59	1140

Table 30. Other catches and effort by species and month for Northern Vancouver Island, 1999.

		Other Catch					Other Released				
		Effort (Boat Trips)	Mackeral	Unident	Other	Shellfish	Mackeral	Unident	Other	Shellfish	
Month	Value										
Jul	Total	12088	143	0	143	4047	0	0	0	12576	
	STD	1799	103	0	103	789	0	0	0	2702	
Aug	Total	20355	0	0	0	5770	5	0	5	16802	
	STD	2675	0	0	0	1003	5	0	5	2865	
Sep	Total	6708	0	0	0	2141	0	0	0	3117	
	STD	408	0	0	0	671	0	0	0	1176	
Total			39151	143	0	143	11958	5	0	5	32495
STD			3249	103	0	103	1441	5	0	5	4111

Table 31. Other catches and effort by species and Statistical Sub-area for Northern Vancouver Island, 1999.

Area	Value	Effort (Boat Trips)	Other Catch				Other Released			
			Mackeral	Unident	Other	Shellfish	Mackeral	Unident	Other	Shellfish
12A	Total	6697	14	0	14	1959	1	0	1	5549
	STD	1369	16	0	16	479	2	0	2	1401
12B	Total	25396	98	0	98	7797	3	0	3	20959
	STD	2923	98	0	98	1336	5	0	5	3783
12C	Total	6328	27	0	27	1985	1	0	1	5327
	STD	342	26	0	26	244	1	0	1	767
12D	Total	730	4	0	4	217	0	0	0	660
	STD	142	5	0	5	55	0	0	0	183
12	Total	39151	143	0	143	11958	5	0	5	32495
	STD	3249	103	0	103	1441	5	0	5	4111

Table 32. Monthly CPUE (catches per boat trip) by species for Northern Vancouver Island, 1999.

Month	Salmon Catch					Salmon Released			Groundfish Catch				Total Catch Success	
	Chinook	Coho	Chum	Pink	Sockeye	Total Salmon	Chinook	Coho	Other Salmon	Halibut	Lingcod	Rockfish		Other
Jul	0.23	0.00	0.01	0.33	0.02	0.60	0.23	0.39	0.67	0.30	0.05	0.50	0.01	1.46
Aug	0.22	0.02	0.02	1.89	0.06	2.21	0.12	0.88	1.23	0.12	0.05	0.47	0.00	2.85
Sep	0.08	0.00	0.00	1.48	0.00	1.57	0.24	1.82	2.50	0.09	0.07	0.55	0.00	2.27
Yearly	0.20	0.01	0.02	1.34	0.04	1.60	0.17	0.89	1.27	0.17	0.05	0.49	0.00	2.32

* Calculated using tables 22, 24, 26 and 30

Table 33. Monthly number of adipose-clipped chinook observed for Northern Vancouver Island, 1999.

Jun	Uncipped	13
Jun	Clipped	1
Jun	Total	14
Jul	Uncipped	152
Jul	Clipped	4
Jul	Total	156
Aug	Uncipped	303
Aug	Clipped	11
Aug	Total	314
Sep	Uncipped	13
Sep	Clipped	2
Sep	Total	15
Total	Uncipped	481
	Clipped	18
	Total	499
Proportion of Marks		0.036

Table 34. Monthly estimated catches of adipose-clipped chinook for Northern Vancouver Island, 1999.

Jul	Catch	72
	STD	38
Aug	Catch	155
	STD	52
Sep	Catch	74
	STD	55
Total	Catch	302
	STD	71

Table 35. Monthly number and percent age composition of chinook sampled for age in Northern Vancouver Island Creel Survey, 1999.

Month	Age 3		Age 4		Age 5		Age 6		Total Sampled
	n	%	n	%	n	%	n	%	
Jul	66	27.6%	140	58.6%	30	12.6%	3	1.3%	239
Aug	92	39.7%	119	51.3%	21	9.1%	0	0.0%	232
Sep	4	57.1%	3	42.9%	0	0.0%	0	0.0%	7
Total	162		262		51		3		478
Overall age composition of catch*		36.5%		53.3%		9.7%		0.5%	

Table 36. Monthly estimated catches at age of chinook for Northern Vancouver Island, 1999.

Month		Age 3	Age 4	Age 5	Age 6	Total
Jul	Catch	779	1653	354	35	2822
	STD	82	91	61	20	138
Aug	Catch	1760	2276	402	0	4437
	STD	143	146	84	0	221
Sep	Catch	317	237	0	0	554
	STD	104	104	0	0	147
Total	Catch	2855	4166	756	35	7813
	STD	195	201	103	20	299
Annual Percentage		36.5%	53.3%	9.7%	0.5%	100.0%

Table 37. Monthly mean nose-fork length (L) at age of chinook sampled in the Northern Vancouver Island Creel Survey, 1999.

Month	Age 3		Age 4		Age 5		Age 6		Total Sampled
	L (cm)	n	L (cm)	n	L (cm)	n	L (cm)	n	
Jul	724.9	66	815.9	140	875.1	30	920.0	3	239
Aug	741.8	92	829.2	119	922.1	21			232
Sep	782.3	4	895.0	3					7
Avg.	749.6	162	846.7	262	898.6	51	920.0	3	478

FIGURES

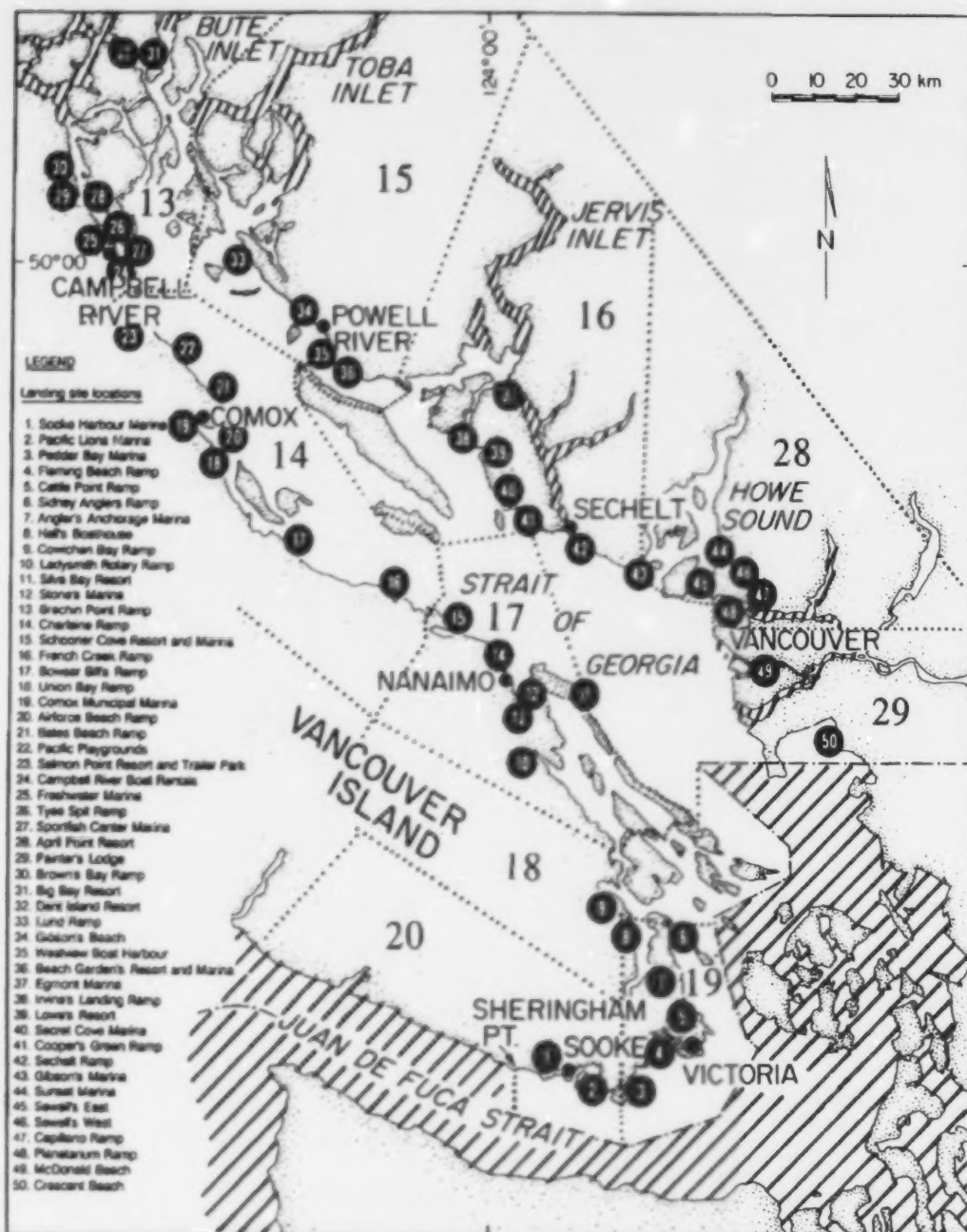


Figure 1. Strait of Georgia creel survey study area and landing site location, 1999.

GEORGIA STRAIT SPORT FISHING CREEL SURVEY

Landing Site: _____ / _____
 Interviewer: _____ / _____ Date: ____ / ____ / ____

PRESENT BOAT TRIP COMPLETED

1. Total number of individuals in party: AM PM

2. Time of landing: ____ : ____ PM Time Block

3. Was your party sport fishing on this trip: YES NO

4. Guided: YES NO

5. Residences of party: BC Rest of Canada US Other

6. Time of departure: ____ : ____ PM Length of boat trip HRS

7. Times lines were in the water: (EXCLUDE time not fishing)

☐ 1) Before 7:00	☐ 5) 10:00 - 10:59	☐ 9) 2:00 - 2:59	☐ 13) 8:00 - 8:59
☐ 2) 7:00 - 7:59	☐ 6) 11:00 - 11:59	☐ 10) 3:00 - 3:59	☐ 14) 7:00 - 7:59
☐ 3) 8:00 - 8:59	☐ 7) 12:00 - 12:59	☐ 11) 4:00 - 4:59	☐ 15) 8:00 - 8:59
☐ 4) 9:00 - 9:59	☐ 8) 1:00 - 1:59	☐ 12) 5:00 - 5:59	☐ 16) 9:00 - Plus

8. Number of lines in the water for TOTAL boat party:

9. **CATCH SUMMARY**

STAT. SUB AREA	TIME	GEAR CODE	Qty Unit	SPECIES KEPT	RELEASED		Spec. Geographic. Loc.
					Legal	sub legal	Map No.
							Loc. Name
							Map No.
							Loc. Name
							Map No.
							Loc. Name
							Map No.
							Loc. Name

TOTAL CATCH

TOTAL TIME FISHING	MARKS	CHINOOK		COHO		HEAD TAG #
		ADIPOSE MISSING	UNMARKED	ADIPOSE MISSING	UNMARKED	
HRS						
	BEEP					
	NO BEEP					

10. How much fishing time was directed at the following?

CN	CO	SM	LC	RF	HA	GF	SF	OTH
----	----	----	----	----	----	----	----	-----

11. Did anyone in your party lose any catch today to seals or sea lions? If so how many and what species?

CN	CO	PK	SO	CM	AT	SM	RF
----	----	----	----	----	----	----	----

Assessment Code

0 = Complete Form ☐
 1 = Marks Incomplete ☐
 2 = Shell fishing only ☐
 3 = Not Visually Inspected ☐
 4 = Refusal ☐

Units of Qty. used 1= number 2= weight

Figure 2. Sample of 1999 Strait of Georgia interview form.

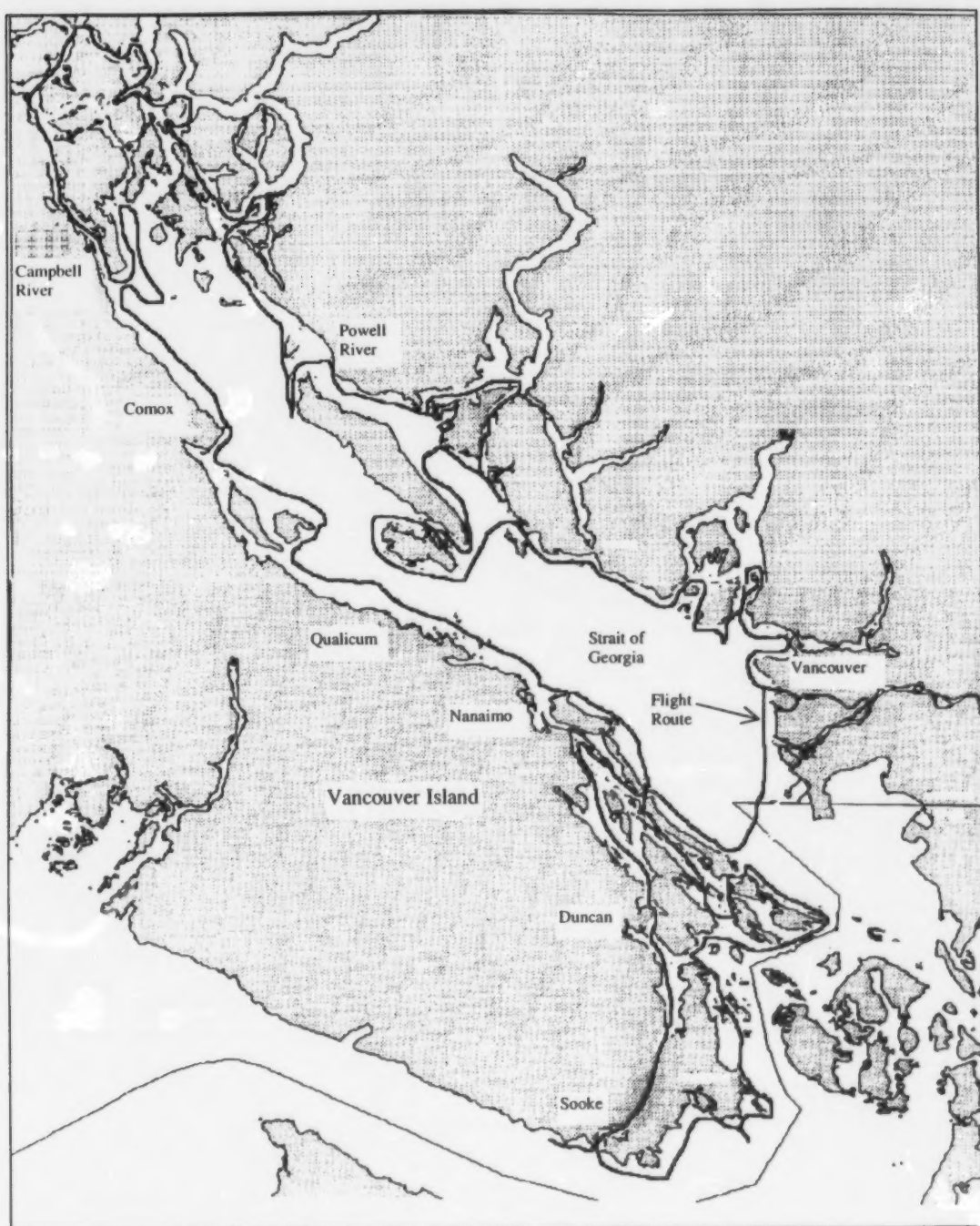


Figure 3. Overflight routes for the Strait of Georgia, 1999.

Effort and Fishing Interviews

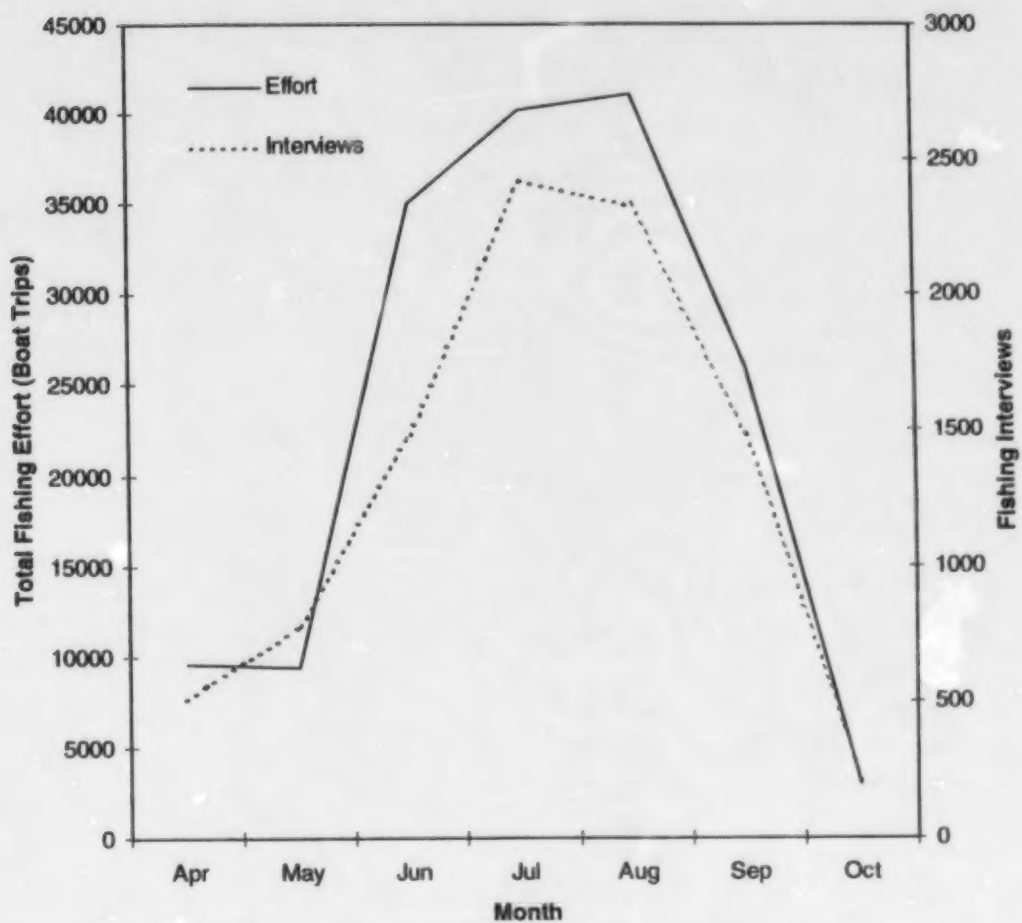


Figure 4. Comparison of monthly total fishing effort and monthly fishing interviews, Strait of Georgia, 1999.

Effort and Catch for the Strait of Georgia

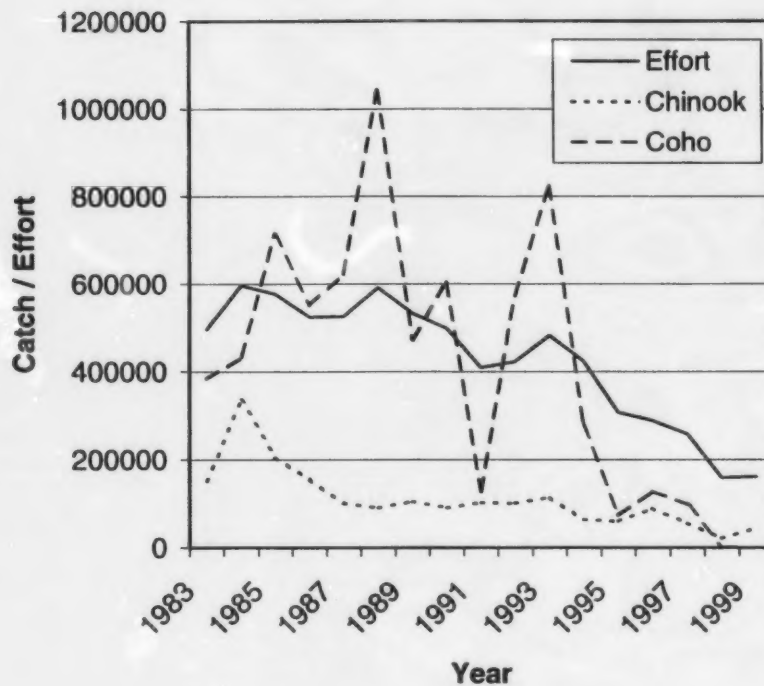


Figure 5. Tidal effort (boat trips) statistics and sport catches of chinook and coho salmon for the Strait of Georgia, 1983 – 1999*.

*For the purposes of historical comparisons only the data from April to September were used. See Appendix E-3 for historical data graph 1960 to 1982.

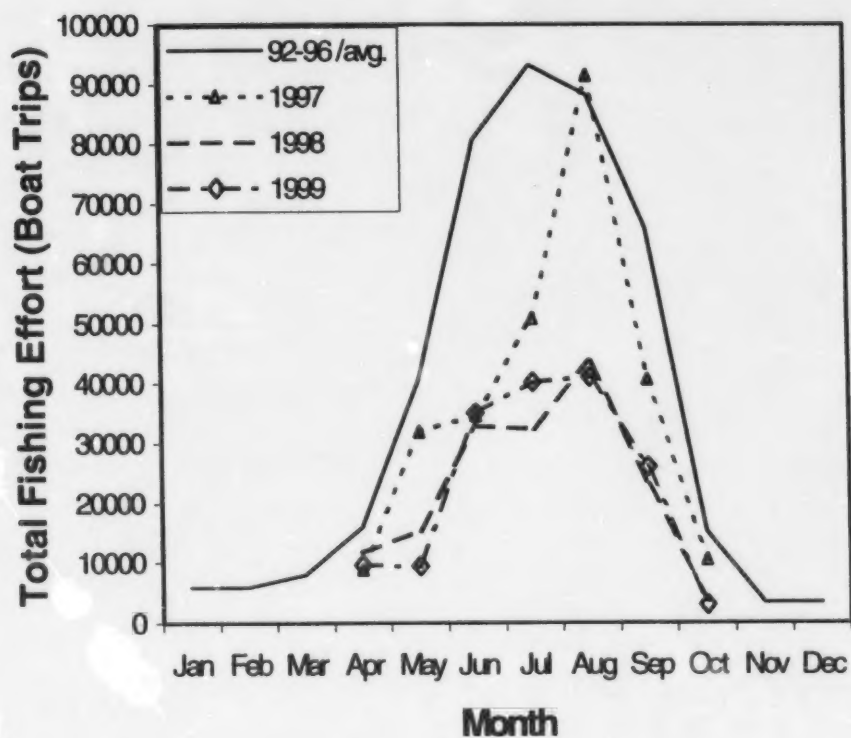


Figure 6. Monthly fishing effort estimates (boat trips) for the Strait of Georgia sport fishery for 1997, 1998, 1999 and the 5 year avg. for 1992 to 1996.

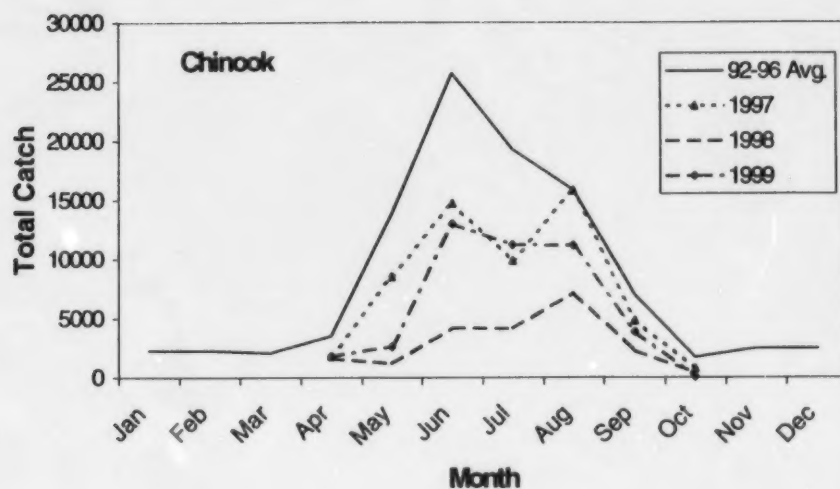


Figure 7. Monthly chinook catches for the Strait of Georgia sport fishery for 1997, 1998, 1999 and the five year avg. for 1992 to 1996.

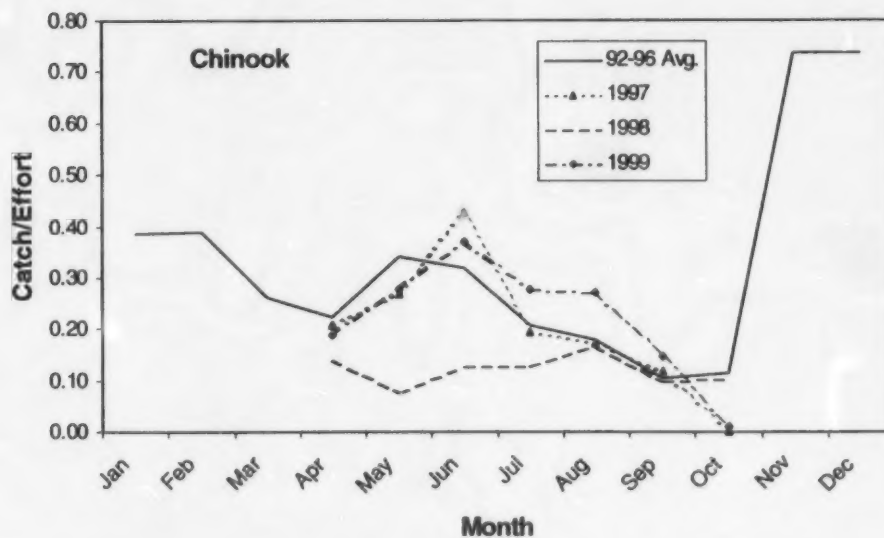


Figure 8. Monthly chinook catches per boat trip for the Strait of Georgia sport fishery for 1997, 1998, 1999 and the five year avg. for 1992 to 1996.

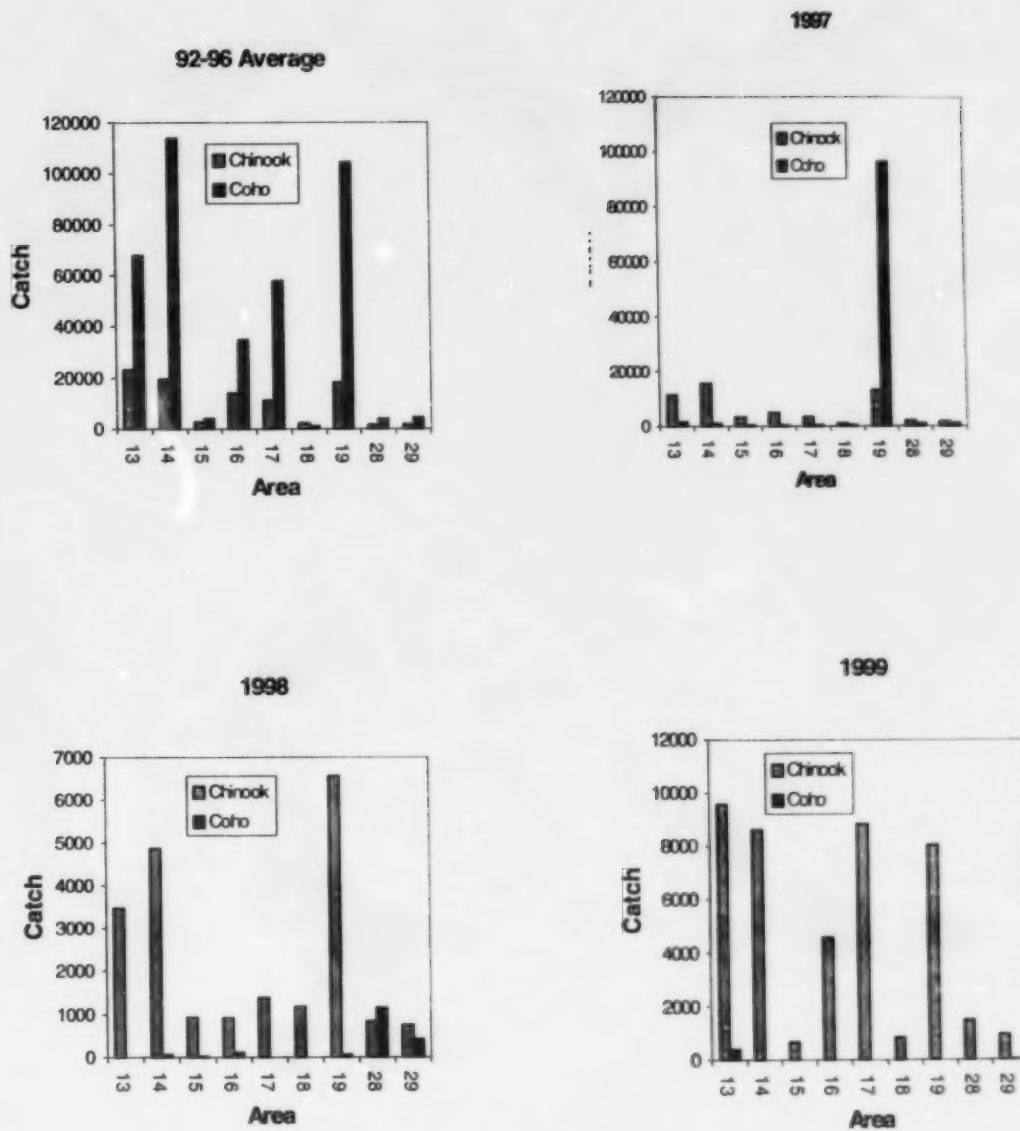


Figure 9. Annual sport catches of chinook and coho salmon by Statistical Area in the Strait of Georgia, 1992-1996 avg., 1997, 1998 and 1999.

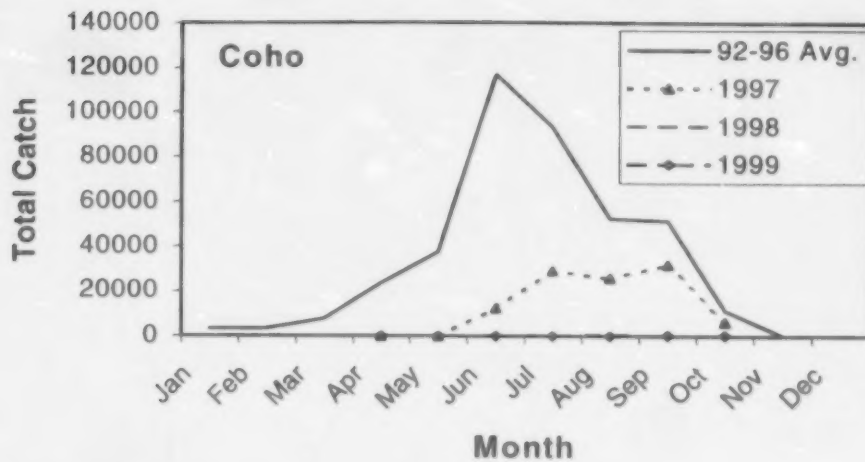


Figure 10. Monthly coho catches for the Strait of Georgia sport fishery for 1992-1996 avg., 1997, 1998 and 1999.

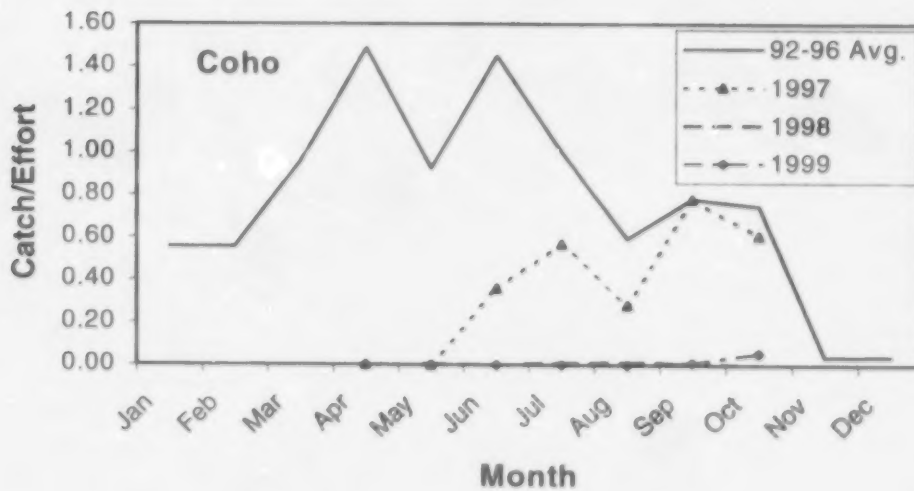


Figure 11. Monthly coho catches per boat trip for the Strait of Georgia sport fishery for 1992-1996 avg., 1997, 1998 and 1999.

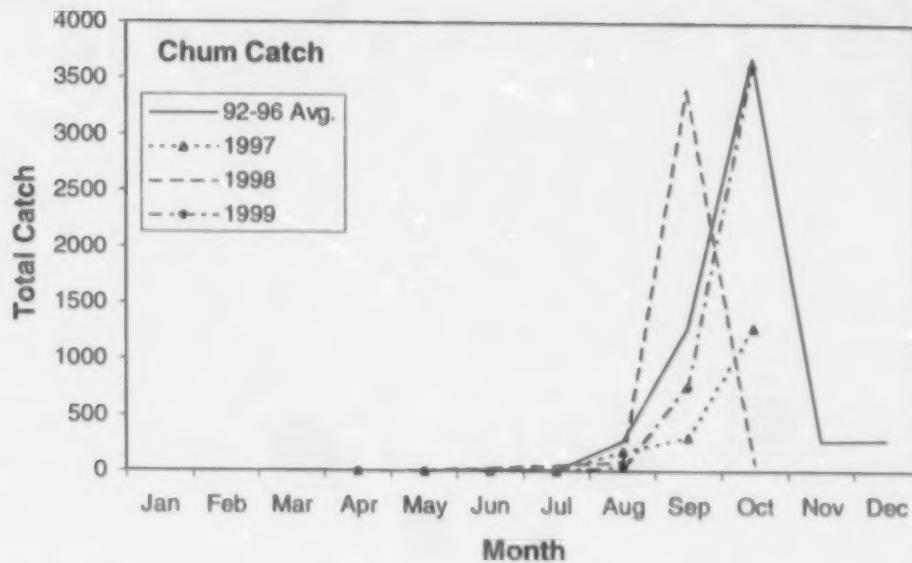


Figure 12. Monthly chum catches for the Strait of Georgia sport fishery, 1992-1996 avg., 1997, 1998 and 1999.

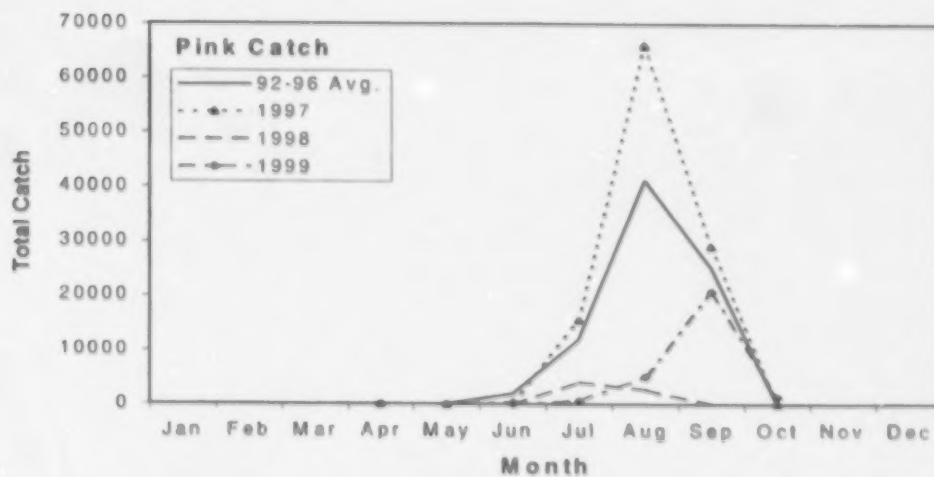


Figure 13. Monthly pink catches for the Strait of Georgia sport fishery, 1992-1996 avg., 1997, 1998 and 1999.

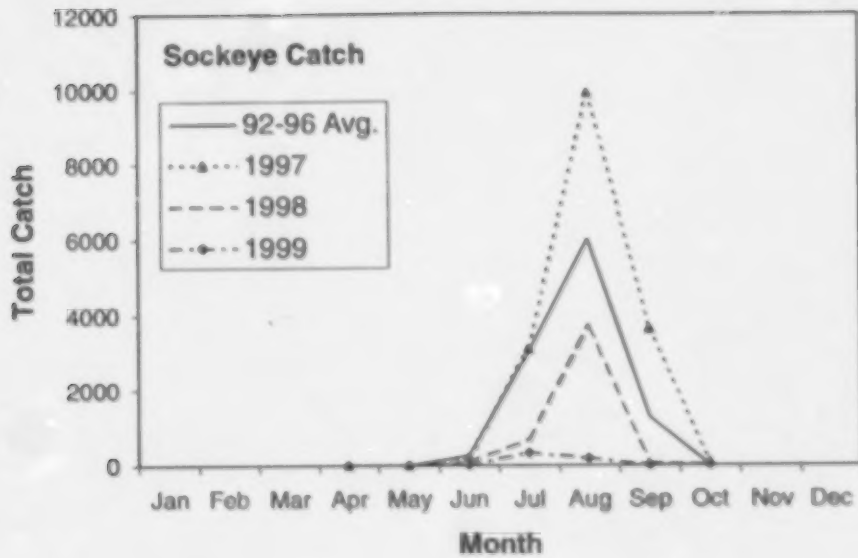


Figure 14. Monthly sockeye catches for the Strait of Georgia sport fishery for 1992-1996 avg., 1997, 1998 and 1999.

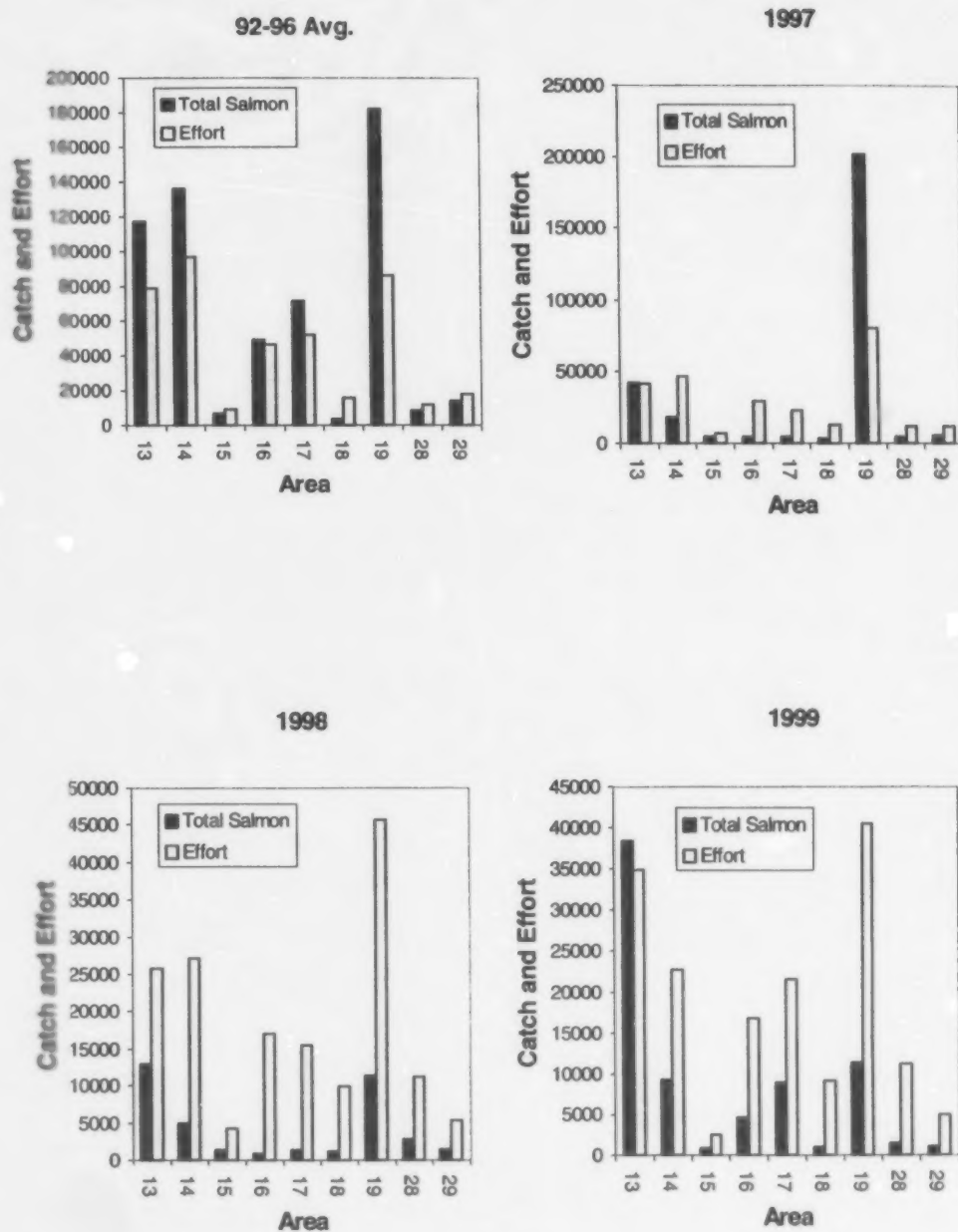


Figure 15. Total salmon landed and total fishing effort expended by Statistical Area in the Strait of Georgia sport fishery, 1992-1996 avg., 1997, 1998 and 1999.

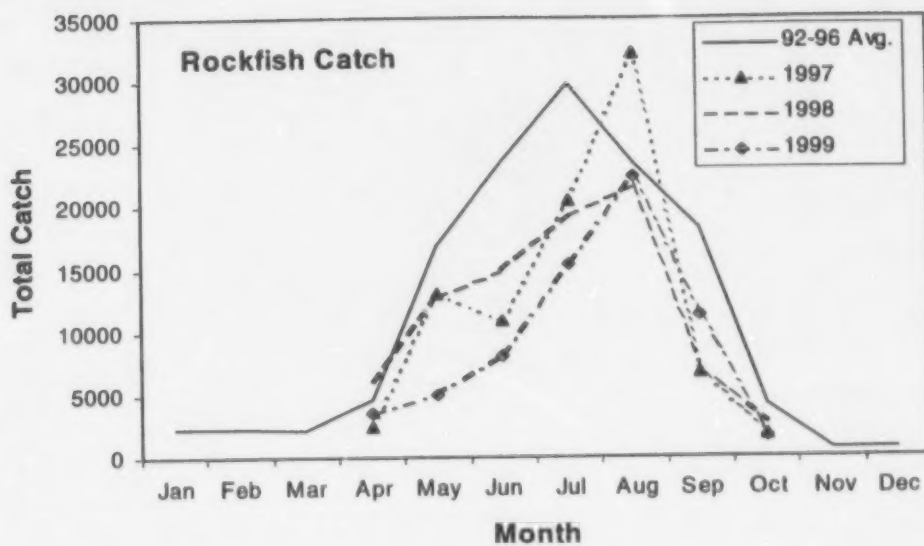


Figure 16. Monthly rockfish catches for the Strait of Georgia sport fishery, 1992-1996 avg., 1997, 1998 and 1999.

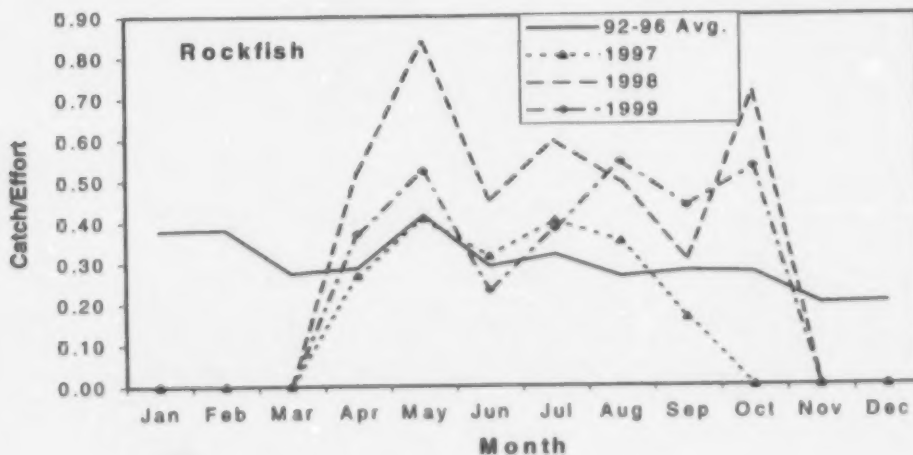


Figure 17. Monthly rockfish catches per boat trip for the Strait of Georgia, 1992-1996 avg., 1997, 1998 and 1999.

Age Composition

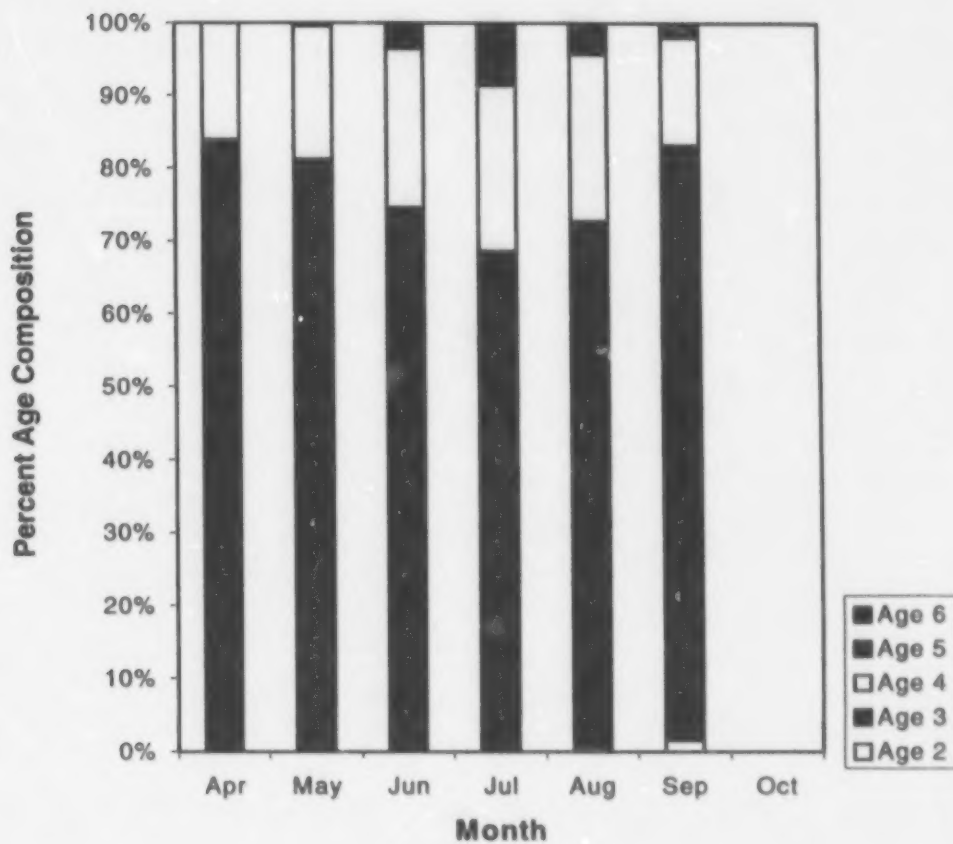


Figure 18. Monthly percent age composition of chinook salmon sampled in the Strait of Georgia Creel Survey, 1999.

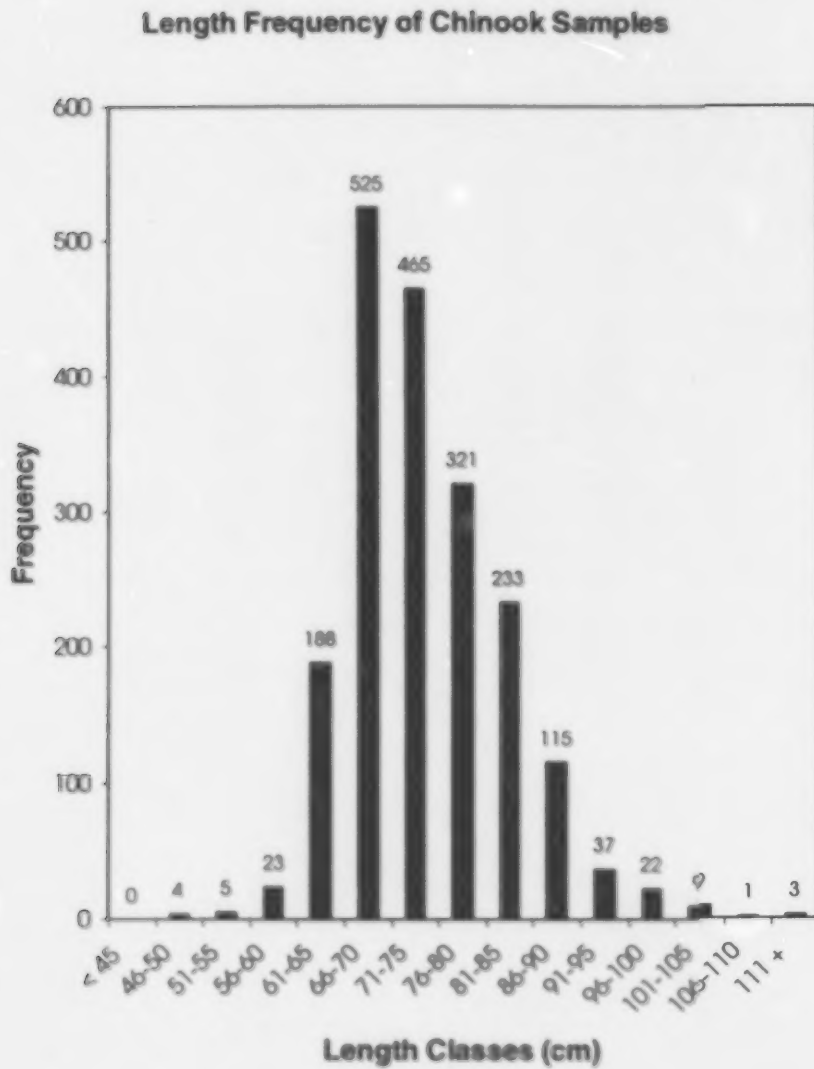


Figure 19. Length frequency distribution of chinook salmon sampled in the Strait of Georgia Creel Survey, 1999.

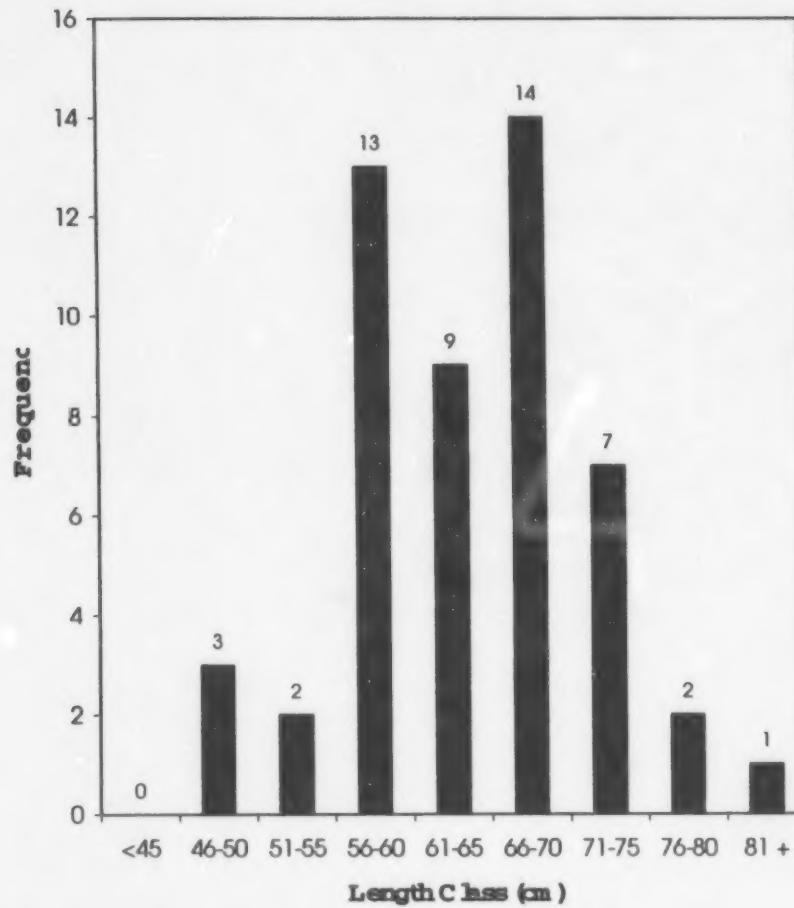
Length Frequency of Sampled Coho

Figure 20. Length frequency distribution of coho salmon sampled in the Strait of Georgia Creel Survey, 1999.

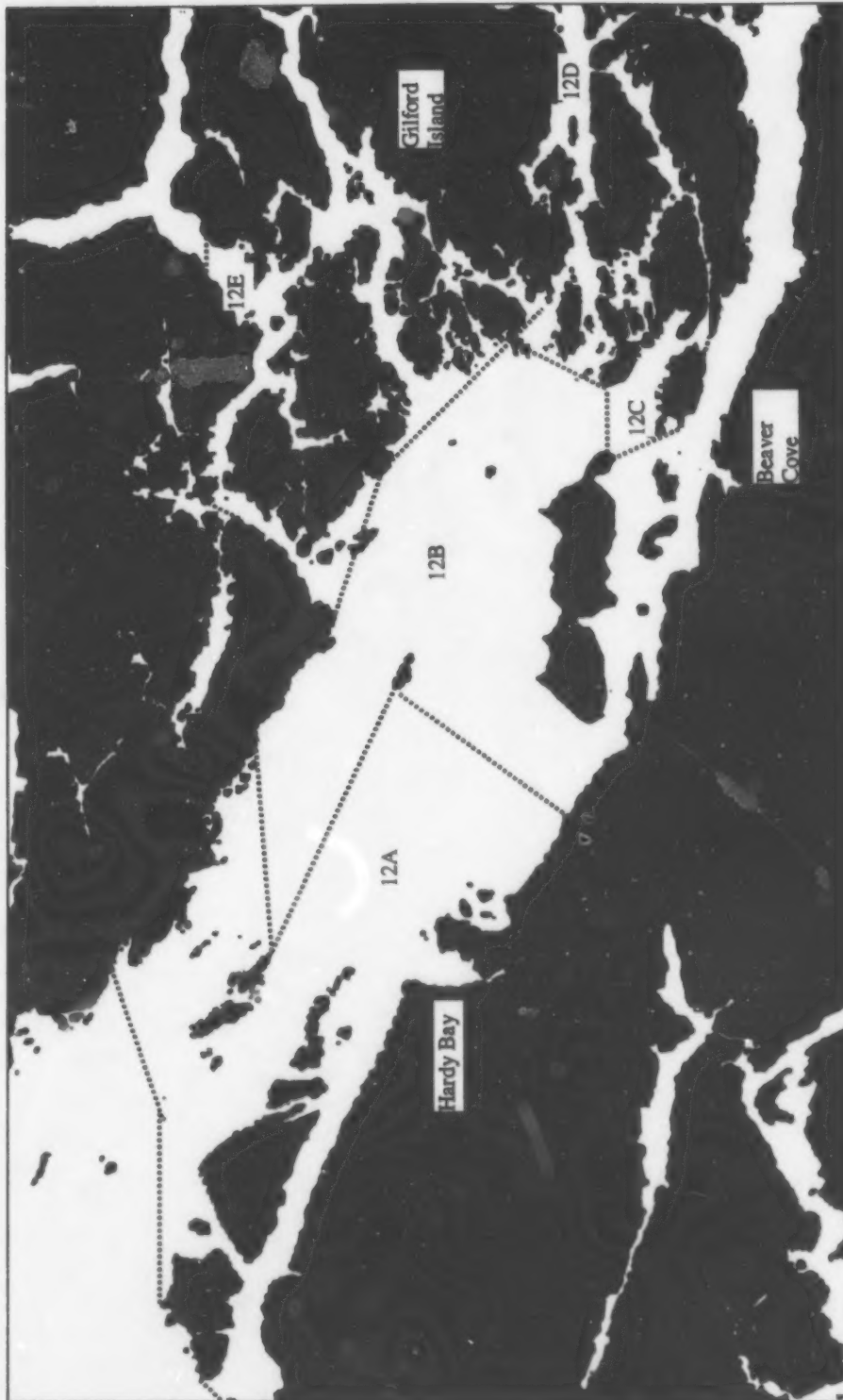


Figure 21. Statistical sub area map for the Northern Vancouver Island creel survey.

Effort and Fishing Interviews

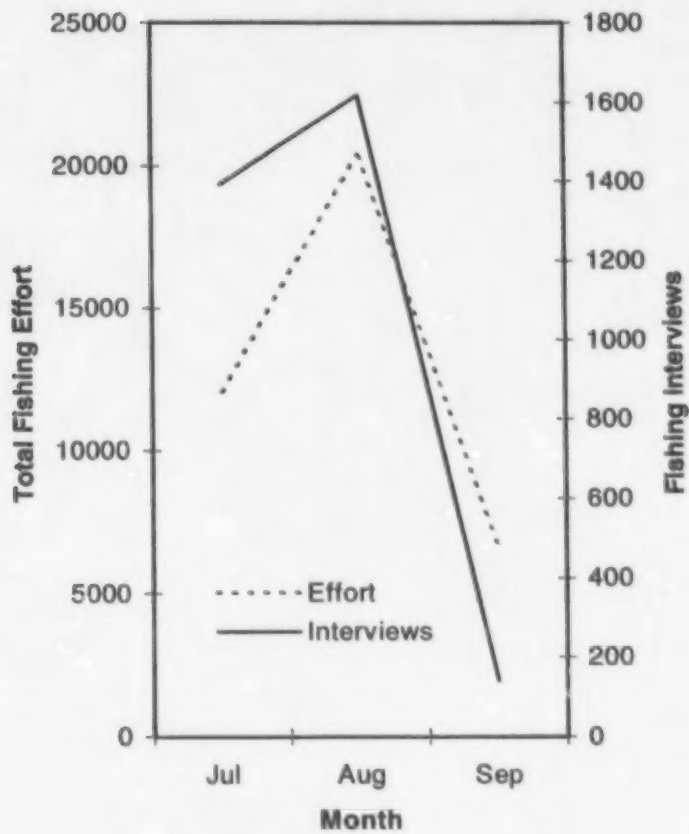


Figure 22. Comparison of monthly total fishing effort and monthly fishing interviews, Northern Vancouver Island, 1999.

[illegible]

Figure 23. Northern Vancouver Island interview form, 1999.

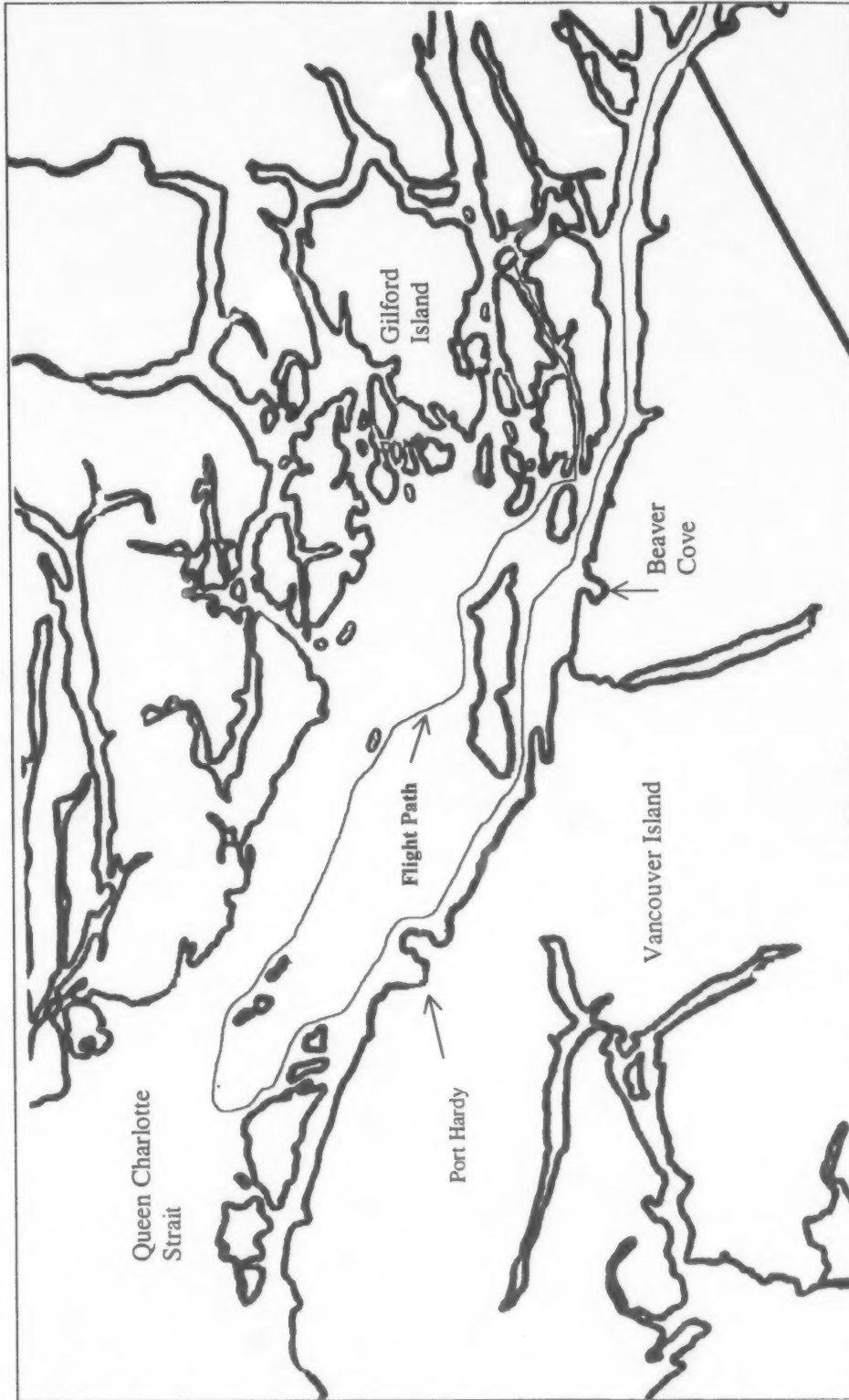


Figure 24. Northern Vancouver Island overflight routes, 1999.

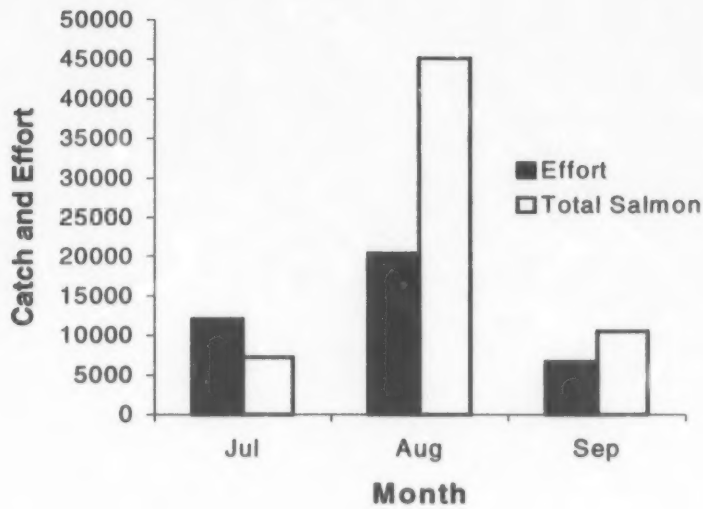


Figure 25. Total salmon catch and effort (boat trips) by month for Northern Vancouver Island, 1999.

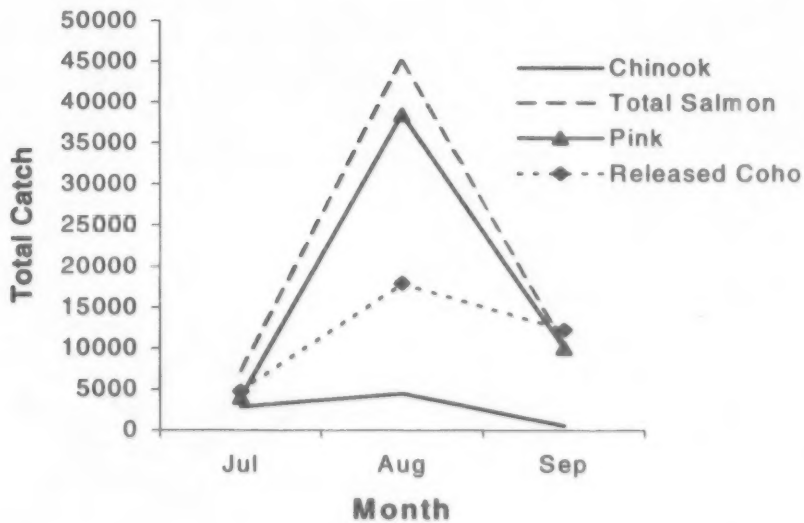


Figure 26. Comparison of monthly salmon catch between major target species in Northern Vancouver Island, 1999.

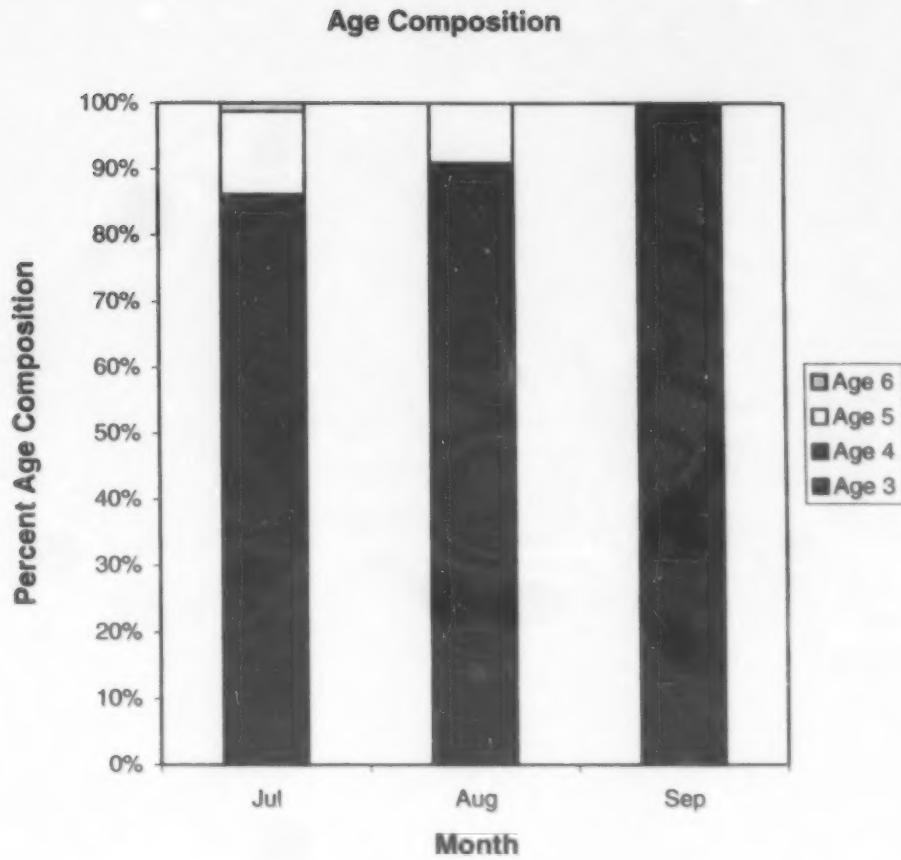


Figure 27. Monthly percent age composition of chinook salmon sampled in the Northern Vancouver Island Creel Survey, 1999.

Length Frequency of Chinook Samples

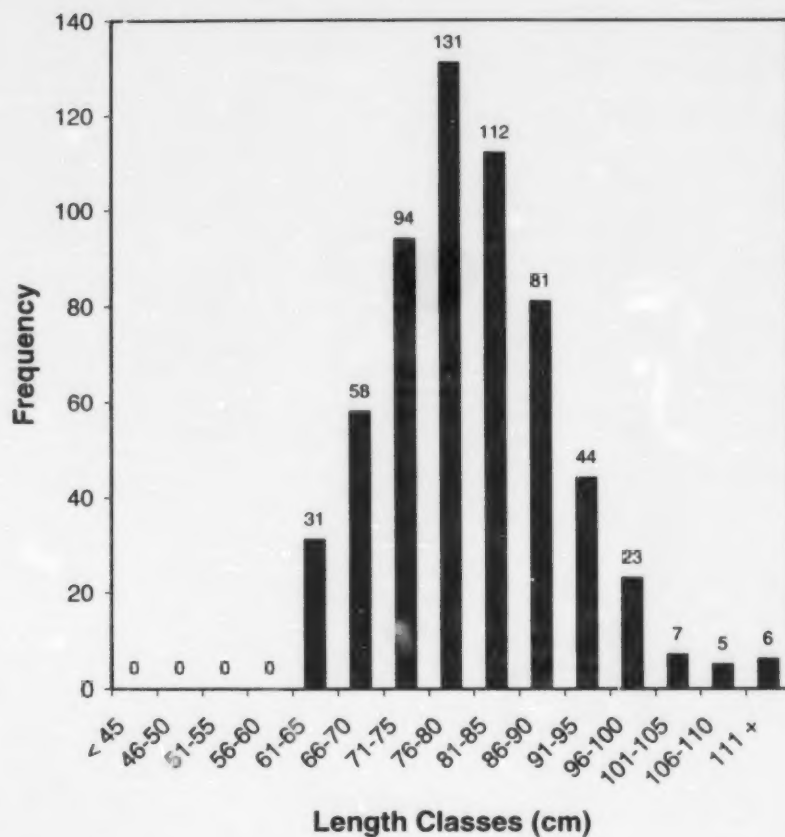


Figure 28. Length frequency distribution of chinook salmon sampled in the Northern Vancouver Island Creel Survey, 1999.

APPENDICES

APPENDIX A. PREVIOUS STRAIT OF GEORGIA AND NORTHERN
VANCOUVER ISLAND CREEL SURVEY REPORTS.

Shardlow, T. F., K. K. English, T. Hoyt, G. E. Gillespie and T. A. Calvin. 1989. Strait of Georgia Creel Survey sport fishery statistics, 1983. Can. Manuscr. Rep. Fish. Aquat. Sci. 1872: 53 p.

Shardlow, T. F. and L. D. Collicutt. 1989 a. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1984. Can. Manuscr. Rep. Fish. Aquat. Sci. 2032: 61 p.

Shardlow, T. F. and L. D. Collicutt. 1989 b. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1985. Can. Manuscr. Rep. Fish. Aquat. Sci. 2033: 60 p.

Shardlow, T. F. and L. D. Collicutt. 1989 c. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1986. Can. Manuscr. Rep. Fish. Aquat. Sci. 2034: 61 p.

Shardlow, T. F. and L. D. Collicutt. 1989 d. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1987. Can. Manuscr. Rep. Fish. Aquat. Sci. 2035: 62 p.

Shardlow, T. F. and L. D. Collicutt. 1989 e. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1988. Can. Manuscr. Rep. Fish. Aquat. Sci. 2036: 63 p.

Collicutt, L. D. and T. F. Shardlow. 1990. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1989. Can. Manuscr. Rep. Fish. Aquat. Sci. 2087: 75 p.

Collicutt, L. D., B. G. Naito, P. Ryall, and L. Lapi. 1992. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1991. Can. Tech. Rep. Fish. Aquat. Sci. 1857: 121 p.

Collicutt, L. D. and T. F. Shardlow. 1992. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1990. Can. Manuscr. Rep. Fish. Aquat. Sci. 2109: 76 p.

Collicutt, L. D. and T. F. Shardlow. 1995. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1991. Can. Manuscr. Rep. Fish. Aquat. Sci. 2137: 75 p.

Collicutt, L. D. and T. F. Shardlow. 1994. Strait of Georgia sport fishery creel survey statistics for salmon and groundfish, 1992. Can. Manuscr. Rep. Fish. Aquat. Sci. 2221: 75 p.

Collicutt, L. D., T. F. Shardlow, B. D. Smith, and G. E. Gillespie. 1994. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1992. Can. Tech. Rep. Fish. Aquat. Sci. 1973: 53 p.

Collicutt, L. D., T. F. Shardlow, B. D. Smith, and G. E. Gillespie. 1994. Northern Vancouver Island sport fishery creel survey statistics for salmon and groundfish, 1993. Can. Manuscr. Rep. Fish. Aquat. Sci. 1974: 53 p.

Hardie, D. C., D. A. Nagtegaal, and L. Nagy. 1999. Strait of Georgia sport fishery and Northern Vancouver Island creel survey statistics for salmon and groundfish, 1998. Can. Manuscr. Rep. Fish. Aquat. Sci. 2500: 92 p.

APPENDIX B. STRAIT OF GEORGIA CREEL SURVEY STUDY AREA.

The Strait of Georgia Creel Survey study area and landing site locations used in 1998 are shown in Appendix B-2. The study area includes those waters of Juan de Fuca Strait and the Strait of Georgia bounded in the south by a line from Sheringham Pt. on Vancouver Island due south to an intersection with the International Boundary and along the International Boundary to the B.C. Mainland coast at Blaine (Boundary Bay) and in the northern by the following 3 boundary lines:

- 1) Discovery Passage from Granite Pt. on Quadra Island to the stream mouth west of Moriarty Pt. on Vancouver Island.
- 2) Okisollo Channel from Granite Pt. on Quadra Island due northern to Sonora Island.
- 3) Cordero Channel from Burnt Bluff on the mainland 214° passing west of Dent Island to Sonora Island.

The area for which the Strait of Georgia Creel Survey statistics apply includes the above listed administrative area with the exception of the following areas:

- 1) Bute Inlet above a line from Lawrence Pt. running across the inlet. This area coincides with management units 13-21 and 13-22.
- 2) Waters of Pryce Channel, Waddington Channel, Pendrell Sound, Homfray Channel and Toba Inlet bounded by a line drawn from Horace Head on East Redonda Island at the south end of Waddington Channel to the northern point of Roscoe Bay on West Redonda Island and a line drawn within Homfray Channel from Price Pt. on the eastern shore of the channel by a line drawn from George Head at the easterly entrance of Ramsay Arm to Sutil Pt. on Cortes Island.
- 3) Hotham Sound above a line drawn from Elephant Pt. on the western shore of the Sound to the southern point of Granville Bay on the eastern shore of the Sound.
- 4) Jervis Inlet above a line drawn within Prince of Whales Reach from the mouth of Treat Creek on the east shore across the Reach to the Summit ($1625'$) at the head of Goliath Bay.
- 5) Sechelt Inlet including Narrows Inlet and Salmon Inlet above a line drawn within Skookumchuck Narrows from the "dog-leg" point south-east of the Egmont Pt. 224° across the Narrows to Sechelt Peninsula.

APPENDIX C. METHODS AND EQUATIONS USED IN ANALYSIS OF CATCH AND EFFORT STATISTICS FOR THE STRAIT OF GEORGIA AND NORTHERN VANCOUVER ISLAND SPORT FISHERY CREEL SURVEY.

Description of terms, variables and subscripts used in this report.

DESCRIPTION OF TERMS

Shift/Stint a single day. i.e. one	-	Represents a combination of a day type and landing site which was sampled on sampling stint performed by an interviewer.
Work block	-	Represents one of four possible periods at a particular site of a given day type. Work Block 1 is before 11 am Work Block 2 is 11 am - 3 pm Work Block 3 is 3 pm - 7 pm Work Block 4 is after 7 pm
Day type	-	There are two possible day types: weekdays and weekends; holidays are considered to be weekend days.
Time block	-	Each day is divided into 16 time blocks which are: 1) before 7 am 2) 7:00 - 7:59 am 3) 8:00 - 8:59 am 15) 8:00 - 8:59 pm 16) after 9 pm

DESCRIPTION OF VARIABLES

A	-	Number of boats actively fishing
B	-	Number of boats observed on a flight
C	-	Catch
C'	-	Catch of marked salmon
CPE	-	Catch per boat trip
E	-	Effort (estimated total number of boat trips)
I	-	Number of boats interviewed and found to have been fishing
L	-	Number of boats landing
n	-	Number sampled
N	-	Population size from which n samples were observed
P	-	Proportion
T	-	Number of boat trips
V	-	Number found to be marked
W1	-	Weighting factor to expand for all possible stints at each site
W2	-	Weighting factor to expand for all boats that landed in each work

DESCRIPTION OF SUBSCRIPTS

a	-	age
g	-	a set of landing sites
d	-	day type
i	-	site
j	-	work block
k	-	stint
l	-	landing time block
m	-	month
q	-	the next boat landing at site i and upon interviewing, found to have been fishing (q ranges from 1 to n)

r	-	species
s	-	sub-Statistical Area
t	-	time block
u	-	flight
x	-	region
y	-	annual

The description of terms, variables and subscripts used in the data analysis is given in Table C-1.

Calculation of Catch and Effort Statistics

To estimate the monthly catch and effort, three components had to be calculated from a month's data:

- (1) the weighted mean daily fishing pattern from interview data,
- (2) the weighted mean catch per unit effort from interview data and
- (3) the mean sport count from overflight data.

The equations used to estimate the means and variances for all catch and effort statistics are shown below.

Weighting factors used to estimate the daily fishing activity pattern and mean catch per unit effort were calculated using the equations derived from DPA Consulting Ltd. (1982).

The data obtained from each shift were multiplied by the following weighting factor (W1) to expand for all possible stints at each site. The formula reads:

$$W1_{dij} = \frac{N_d}{n_{dij}} \quad (1)$$

where N_d is the total number of days of type d in that month and n_{dij} is the number of times the jth work block at the ith site was sampled on type d days.

The interviews aggregated by work block were multiplied by the weighting factor W2 to expand for all boats that landed in each work block. The formula reads:

$$W2_{dijk} = \frac{L_{dijk}}{I_{dijk}} \quad (2)$$

where L_{dijk} is the number of boats landed and I_{dijk} is the number of boats interviewed on the kth stint in the jth work block at the ith site on a day type d.

Therefore, the following equations can be used to calculate an unbiased estimate of the total monthly catch ($\hat{C}_{dgr}$), fishing trips ($\hat{T}_{dg}$) and fishing activity in time block $\hat{A}_{dgt}$ for each day type (d) where g is a set of landing sites (i). These formulas read:

$$\hat{C}_{dgr} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q (W2_{dijk} C_{dijklqr}) \right] \quad (3)$$

$$\hat{T}_{dg} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q (W2_{dijk}) \right] \quad (4)$$

$$\hat{A}_{dgt} = \sum_i \sum_j \left[W1_{dij} \sum_k \sum_q (W2_{dijk} A_{dijkqt}) \right] \quad (5)$$

where C_{dijkqr} is the catch of species r by the qth fishing party, and A_{dijkqt} can equal 0 or 1, thereby indicating whether the qth fishing party was actively fishing in time block t. Thus, the mean monthly catch per unit effort (CPE_{dgr}) measured in terms of numbers of fish kept per completed boat trip, and proportion of daily fishing effort active during the hour of the aerial survey (P_{dgt}) can be calculated with the following equations:

$$CPE_{dgr} = \frac{\hat{C}_{dgr}}{\hat{T}_{dg}} \quad (6)$$

$$P_{dgt} = \frac{\hat{A}_{dgt}}{\hat{T}_{dg}} \quad (7)$$

where CPE_{dgr} and P_{dgt} are calculated for each day type (d) and group of landing sites (g).

The groups of landing sites reflect geographic areas with similar catch rates and/or activity patterns.

The estimated mean number of boats fishing during the hour of the sport boat count by overflight was calculated for each sub-Statistical Area using the following equation:

$$\bar{B}_{dst} = \frac{\sum_u B_{sdtu}}{n_{ds}} \quad (8)$$

where B_{sdtu} is the number of boats observed fishing on flight u at time t , in sub-Statistical Area s for day type d .

The mean sport boat count at the time of the overflight ($\bar{B}_{dst}$) and proportion of daily fishing effort active during the hour of the overflight (P_{dgt}) were used in the following equation to calculate the total fishing effort for sub-Statistical Area s on day type d :

$$E_{ds} = \bar{B}_{dst} \frac{1}{P_{dgt}} N_d \quad (9)$$

where N_d is the number of type d days in the month. Interview data for the sub-Statistical Areas fished (s) by anglers landing at each of the sites (i) within a landing group (g) were used to select the proportions (P_{dgt}) that are appropriate for each mean boat count ($\bar{B}_{dst}$).

The estimate for total effort by sub-Statistical Area and day type (E_{ds}) and the weighted catch per boat trip for a group of landing sites by day type, area and species (CPE_{dgr}) were used to calculate total catch for each species (r) and each sub-Statistical Area (s):

$$C_{sr} = \sum_d (E_{ds} CPE_{dgr}) \quad (10)$$

The interview data were also used to select the catch per effort estimates (CPE_{dgr}) that should be applied to the effort estimates (E_{ds}) for a specific sub-Statistical Area (s).

Variance of Total Fishing Effort

The variance for estimates of total fishing effort has two components:

- (1) the variance in aerial sport boat counts:

$$S^2_{B_{dst}} = \frac{\sum_u B^2_{dstu} - \frac{\left(\sum_u B_{dstu}\right)^2}{n_{ds}}}{n_{ds}(n_{ds} - 1)} \left[\frac{N_d - N_{ds}}{N_d - 1} \right] \quad (11)$$

where B_{dstu} is the aerial sport boat count at time t during an aerial survey u on a type d day in sub-area s ; n_{ds} is the number of aerial surveys in which boats were counted on type d days, in sub-Statistical Area s ; and N_d is the total number of type d days in the months.

- (2) the variance in the proportion of boats fishing during the hours of the aerial boat counts:

$$S^2_{P_{dgt}} = \frac{P_{dgt}(1 - P_{dgt})}{I_{dg}} \quad (12)$$

where P_{dgt} is the mean proportion of boats fishing for a group of landing sites g during the hour of the aerial boat count t on type d days, and I_{dg} is the total number of sport fishing boats interviewed. The above formula assumes P_{dgt} is unbiased and normally distributed where the number of interviews is large.

The variances for boat counts ($S^2_{B_{dst}}$) and proportion of boats fishing ($S^2_{P_{dgt}}$) were combined in the following equation to calculate variance for effort:

$$S^2_{E_{ds}} = N^2_d \left(\frac{B^2_{dst}}{P^2_{dgt}} \right) \left(\frac{S^2_{B_{dst}}}{B^2_{dst}} + \frac{S^2_{P_{dgt}}}{P^2_{dgt}} \right) \quad (13)$$

where $S^2_{E_{ds}}$ is the variance for total effort on type d days in sub-area s, and the formula is the standard formula for the variance of a ratio of two independent random variables.

Variance of Total Catch

The variance for estimates of total catch had two components: (1) the variance for total effort (presented above), and (2) the variance for catch per boat trip.

The variance for catch per boat trip ($S^2_{CPE_{dgr}}$) was calculated using the following equation:

$$S^2_{CPE_{dgr}} = \frac{SS_{CPE_{dgr}} - \frac{(S_{CPE_{dgr}})^2}{I_{dg}}}{I_{dg}(I_{dg} - 1)} \quad (14)$$

where $SS_{CPE_{dgr}}$ is the weighted sum of squares for CPE_{dgr} , and $S_{CPE_{dgr}}$ is the weighted sum for CPE_{dgr} , such that the sum of the weighting factors used to estimate CPE_{dgr} was equal to the number of interviewed boat trips (I_{dg}).

The variance for total effort and the variance in the catch per boat trip for the appropriately grouped landing sites were combined in the following equation to calculate variance for total catch:

$$S^2_{C_{sr}} = \sum_d (E^2_{ds} S^2_{CPE_{dgr}} + CPE^2_{dgr} S^2_{E_{ds}} + S^2_{CPE_{dgr}} S^2_{E_{ds}}) \quad (15)$$

which is the standard formula for the variance of the product of two independent random variables, and where $S^2_{C_{sr}}$ is the variance for total number of species r in sub-Statistical Area s.

Estimation of Marked Chinook and Coho Salmon

The incidence of marked (adipose-clipped) chinook and coho was recorded in each interview. The proportion of marks observed for each region, month and species (P_{xmr}) was calculated as:

$$P_{xmr} = \frac{V_{xmr}}{n_{xmr}} \quad (16)$$

where V is the number of marked fish observed and n is the number of fish inspected by region (x), month (m) and species (r).

The variance of each proportion was calculated as:

$$S^2_{P_{xmr}} = \frac{P_{xmr}(1 - P_{xmr})}{n_{xmr}} \quad (17)$$

Monthly catch estimates of marked salmon were calculated as:

$$C'_{xmr} = P_{xmr} C_{xmr} \quad (18)$$

where C_{xmr} is the estimated catch of species r in region x and month m .

The variance of the marked catch estimates was calculated as:

$$S^2_{C'_{xmr}} = P^2_{xmr} S^2_{C_{xmr}} + C^2_{xmr} S^2_{P_{xmr}} + S^2_{C_{xmr}} S^2_{P_{xmr}} \quad (19)$$

where $S^2_{C_{xmr}}$ is the variance of the catch estimates of species r in region x and month m .

The estimate annual proportions of marked salmon caught in each region (weighted by the corresponding regional annual catch estimates) were calculated as:

$$P_{xry} = \frac{C'_{xry}}{C_{xry}} \quad (20)$$

where

$$C'_{xry} = \sum_m C'_{xmr} \quad \text{and} \quad C_{xry} = \sum_m C_{xmr} \quad (21)$$

The variance of the annual proportions was calculated as:

(22)

$$S^2_{P_{xy}} = \left(\frac{C'_{xy}}{C_{xy}} \right)^2 \left[\frac{S^2_{C'_{xy}}}{(C'_{xy})^2} + \frac{S^2_{C_{xy}}}{(C_{xy})^2} \right]$$

where $S^2_{C_{xy}}$ is the variance of the annual estimated catch of species r in region x .

Estimation of Age Composition of Chinook Catch

Scale samples and length measurements were taken in a sub-sampling program during the interview process. Ages used in this report represent total age of the fish (including both freshwater and oceanic life) according to the Gilbert-Rich (1927) recording convention.

The proportion of chinook at each age and month (P_{am}) was calculated as:

$$P_{am} = \frac{a_m}{n_m} \quad (23)$$

where a_m represents the number of fish observed at age a during month m , and n_m is the total number of fish bio-sampled in that month.

The variance of each proportion was calculated as:

$$S^2_{am} = \frac{P_{am}(1 - P_{am})}{n_m} \quad (24)$$

The catch at age of chinook in each month was calculated as:

$$C_{am} = P_{am}C_m \quad (25)$$

where C_m is the estimated catch of chinook salmon in a given month m .

The variance of the catch at age estimate was calculated as:

$$S^2_{C_{am}} = P^2_{am}S^2_{C_m} + C^2_mS^2_{P_{am}} + S^2_{C_m}S^2_{P_{am}} \quad (26)$$

where $S^2_{C_m}$ is the variance of the month catch estimate C_m .

The annual catch at age was calculated as:

$$C_{ay} = \sum_m C_{am} \quad (27)$$

with a variance:

$$S^2_{C_{ay}} = \sum_m S^2_{C_{am}} \quad (28)$$

The annual proportion at age (weighted by monthly catch) was calculated as:

$$P_{ay} = \frac{C_{ay}}{C_y} \quad (29)$$

with a variance:

$$S^2_{P_{ay}} = \left(\frac{C_{ay}}{C_y} \right)^2 \left[\frac{S^2_{C_{ay}}}{(C_{ay})^2} + \frac{S^2_{C_y}}{(C_y)^2} \right] \quad (30)$$

APPENDIX D-1. STRAIT OF GEORGIA FISHING EFFORT (NUMBER OF BOAT TRIPS) SUMMARY, 1999.

Month		Statistical Area											Total
		13	14	15	16	17	18	19	28	29	29	29	
Apr	Estimate	1332	589	146	1270	1798	623	2678	789	387	387	387	9612
	STD	237	169	67	317	307	152	599	137	212	212	212	854
May	Estimate	649	354	348	1144	1067	337	3621	1229	677	677	677	9426
	STD	182	115	211	365	207	83	919	411	334	334	334	1183
Jun	Estimate	3976	3902	406	2611	8202	636	13088	1235	917	917	917	34973
	STD	1137	550	115	298	1093	155	2916	260	219	219	219	3396
Jul	Estimate	10267	4484	595	4853	4890	1420	10114	2634	851	851	851	40168
	STD	879	544	106	675	672	239	928	647	177	177	177	1832
Aug	Estimate	9920	8833	885	4675	4277	2305	6292	3002	890	890	890	41079
	STD	876	1471	318	512	561	525	986	561	202	202	202	2283
Sep	Estimate	5797	4595	209	2180	1304	3747	4718	2232	1278	1278	1278	26060
	STD	863	951	68	511	435	611	973	578	321	321	321	1965
Oct	Estimate	2966	0	0	0	0	0	0	0	0	0	0	2966
	STD	538											538
Total		34907	22757	2589	16733	21538	9068	40511	11181	5000	5000	5000	164284
		1989	1926	423	1141	1512	872	3534	1150	616	616	616	5136

APPENDIX D-2. STRAIT OF GEORGIA CHINOOK CATCH SUMMARY, 1999.

Month		Statistical Area										Total
		13	14	15	16	17	18	19	28	29		
Apr	Estimate	159	52	50	524	255	98	397	172	107	1814	
	STD	52	29	31	205	107	32	209	83	77	340	
May	Estimate	103	125	70	342	628	60	566	505	215	2614	
	STD	44	61	25	123	193	62	379	402	170	630	
Jun	Estimate	1714	1201	120	497	4770	35	4064	372	157	12930	
	STD	499	228	48	138	749	25	1417	211	65	1715	
Jul	Estimate	3894	1780	220	1306	1749	83	1687	415	59	11193	
	STD	427	318	44	478	277	34	348	196	20	867	
Aug	Estimate	2952	3915	218	1512	1220	134	1109	7	91	11158	
	STD	322	553	96	555	202	58	250	4	53	914	
Sep	Estimate	705	1554	23	417	210	419	200	11	313	3852	
	STD	123	397	12	272	137	121	142	7	140	566	
Oct	Estimate	29	0	0	0	0	0	0	0	0	29	
	STD	18									18	
Total	Catch	9556	8627	701	4598	8832	829	8023	1482	942	43590	
		745	788	123	829	864	157	1549	501	249	2315	

APPENDIX D-3. STRAIT OF GEORGIA COHO CATCH SUMMARY, 1999.

Month		Statistical Area											Total
		13	14	15	16	17	18	19	28	29			
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	
May	Estimate	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	
Jun	Estimate	0	0	0	0	0	0	0	5	8	13		
	STD	0	0	0	0	0	0	0	5	8	9		
Jul	Estimate	9	0	0	0	0	0	0	0	2	11		
	STD	6	0	0	0	0	0	0	0	2	6		
Aug	Estimate	0	0	0	0	7	0	0	3	8	18		
	STD	0	0	0	0	5	0	0	3	5	8		
Sep	Estimate	246	8	5	0	0	0	0	0	13	272		
	STD	64	6	4	0	0	0	0	1	11	65		
Oct	Estimate	163	0	0	0	0	0	0	0	0	163		
	STD	49									49		
Total	Catch	418	8	5	0	7	0	0	8	31	477		
		81	6	4	0	5	0	0	6	15	83		

APPENDIX D-4. STRAIT OF GEORGIA CHUM CATCH SUMMARY, 1999.

Month		Statistical Area												Total
		13	14	15	16	17	18	19	28	29				
Apr	Estimate STD	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	
May	Estimate STD	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	
Jun	Estimate STD	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	
Jul	Estimate STD	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			0 0	
Aug	Estimate STD	43 15	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			43 15	
Sep	Estimate STD	740 139	0 0	0 0	0 0	0 0	0 0	0 0	0 1	8 9			748 139	
Oct	Estimate STD	3613 724	0	0	0	0	0	0	0	0			3613 724	
Total	Catch	4396 737	0 0	0 0	0 0	0 0	0 0	0 0	0 1	8 9			4404 737	

APPENDIX D-5. STRAIT OF GEORGIA PINK CATCH SUMMARY, 1999.

Month		Statistical Area												Total
		13	14	15	16	17	18	19	28	29				
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	0	
May	Estimate	0	0	0	0	0	0	0	1	4	5	5	5	
	STD	0	0	0	0	0	0	0	1	5	5	5	5	
Jun	Estimate	6	0	0	0	22	0	0	0	0	0	0	28	
	STD	6	0	0	0	12	0	0	0	0	0	0	13	
Jul	Estimate	94	129	2	1	0	0	435	0	2	663	2	663	
	STD	36	87	2	1	0	0	145	0	2	173	2	173	
Aug	Estimate	2791	50	0	1	7	48	2136	3	26	5062	26	5062	
	STD	311	29	0	1	5	19	495	2	12	586	12	586	
Sep	Estimate	19652	388	102	0	0	128	327	4	98	20699	98	20699	
	STD	3079	156	49	0	0	55	261	3	47	3095	47	3095	
Oct	Estimate	1389	0	0	0	0	0	0	0	0	1389	0	1389	
	STD	325									325		325	
Total	Catch	23932	567	104	2	29	176	2898	8	130	27846	130	27846	
		3112	181	49	1	13	58	578	4	49	3172	49	3172	

APPENDIX D-6. STRAIT OF GEORGIA SOCKEYE CATCH SUMMARY, 1999.

Month	Statistical Area												Total
	13	14	15	16	17	18	19	28	29				
Apr	Estimate	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	
May	Estimate	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	
Jun	Estimate	0	0	0	0	11	0	0	0	0	0	11	
	STD	0	0	0	0	8	0	0	0	0	0	8	
Jul	Estimate	16	4	0	0	0	0	297	0	0	0	317	
	STD	8	4	0	0	0	0	173	0	0	0	173	
Aug	Estimate	126	0	0	0	0	2	36	0	0	0	164	
	STD	39	0	0	0	0	2	28	0	0	0	48	
Sep	Estimate	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	
Oct	Estimate	0	0	0	0	0	0	0	0	0	0	0	
	STD	0	0	0	0	0	0	0	0	0	0	0	
Total	Catch	142	4	0	0	11	2	333	0	0	0	492	
		40	4	0	0	8	2	175	0	0	0	180	

APPENDIX D-7. STRAIT OF GEORGIA CATCH SUMMARY FOR TOTAL SALMONIDS, 1999.

Month		Statistical Area											Total
		13	14	15	16	17	18	19	28	29			
Apr	Estimate STD	159 52	52	50	524	255	98	397	172	107		1814 340	
May	Estimate STD	103 44	125 61	70 25	342 123	628 193	60 62	566 379	506 402	218 171		2618 630	
Jun	Estimate STD	1720 499	1201 228	120 48	497 138	4804 755	35 25	4064 1417	376 211	165 68		12982 1718	
Jul	Estimate STD	4013 438	1914 337	222 45	1307 478	1749 277	83 34	2418 441	415 196	63 21		12184 920	
Aug	Estimate STD	5912 569	3966 557	218 96	1513 555	1234 203	184 62	3281 702	13 6	125 55		16446 1222	
Sep	Estimate STD	21343 3316	1951 472	130 55	417 272	210 137	547 136	526 310	16 9	432 172		25572 3385	
Oct	Estimate STD	5194 1012	0	0	0	0	0	0	0	0		5194 1012	
Total	Catch	38444 3576	9209 839	810 135	4600 829	8880 869	1007 170	11252 1726	1498 502	1110 270		76810 4276	

APPENDIX D-8. STRAIT OF GEORGIA SUMMARY FOR TOTAL RELEASED SALMONIDS, 1999*.

Month		Statistical Area											Total
		13	14	15	16	17	18	19	28	29			
Apr	Estimate	1453	153	35	286	343	181	486	86	748		3771	
	STD	378	70	22	157	121	58	239	41	539		735	
May	Estimate	217	200	167	147	368	15	204	1358	496		3172	
	STD	72	75	168	46	121	11	169	1016	404		1131	
Jun	Estimate	1965	1228	173	324	4764	201	1026	425	192		10298	
	STD	506	222	55	78	759	142	967	186	75		1373	
Jul	Estimate	4838	4329	549	2410	3952	70	648	761	185		17742	
	STD	700	873	109	499	629	31	184	458	59		1469	
Aug	Estimate	12650	16249	1215	3555	6896	196	918	2166	319		44164	
	STD	1276	3762	551	889	1069	60	261	2021	104		4710	
Sep	Estimate	10588	6569	232	443	1568	1568	748	15	504		22235	
	STD	1652	1746	87	223	799	373	517	9	175		2629	
Oct	Estimate	4408	0	0	0	0	0	0	0	0		4408	
	STD	897										897	
Total	Catch	36119	28728	2371	7165	17891	2231	4030	4811	2444		105790	
		2461	4245	596	1059	1668	409	1179	2316	710		5980	

*Includes chinook, coho, chum, pink, sockeye, steelhead and cutthroat trout.

APPENDIX D-9. STRAIT OF GEORGIA HALIBUT CATCH SUMMARY, 1999.

Month		Statistical Area										Total
		13	14	15	16	17	18	19	28	29		
Apr	Estimate	0	0	0	0	0	6	14	0	0	20	
	STD	0	0	0	0	0	7	21	0	0	22	
May	Estimate	0	0	0	0	0	0	974	0	0	974	
	STD	0	0	0	0	0	0	677	0	0	677	
Jun	Estimate	24	0	0	0	0	0	434	0	0	458	
	STD	21	0	0	0	0	0	457	0	0	457	
Jul	Estimate	0	0	0	0	0	0	535	0	0	535	
	STD	0	0	0	0	0	0	326	0	0	326	
Aug	Estimate	14	37	0	1	0	0	96	0	0	148	
	STD	8	31	0	1	0	0	44	0	0	54	
Sep	Estimate	0	0	0	0	0	0	353	0	0	353	
	STD	0	0	0	0	0	0	164	0	0	164	
Oct	Estimate	0	0	0	0	0	0	0	0	0	0	
	STD	0									0	
Total	Catch	38	37	0	1	0	6	2406	0	0	2488	
		22	31	0	1	0	7	896	0	0	897	

APPENDIX D-10. STRAIT OF GEORGIA LINGCOD CATCH SUMMARY, 1999.

Month		Statistical Area												Total
		13	14	15	16	17	18	19	28	29	29	29	29	
Apr	Estimate	10	0	0	0	0	0	0	0	0	0	0	0	10
	STD	9	0	0	0	0	0	0	0	0	0	0	0	9
May	Estimate	23	0	0	0	29	0	0	0	0	0	0	0	52
	STD	32	0	0	0	25	0	0	0	0	0	0	0	41
Jun	Estimate	338	21	1	6	118	17	74	0	6	6	6	6	581
	STD	112	18	2	6	35	10	31	0	6	6	6	6	123
Jul	Estimate	306	2	4	60	174	64	321	149	24	24	24	24	1104
	STD	57	2	2	32	41	29	164	109	11	11	11	11	214
Aug	Estimate	518	40	16	45	168	13	256	1	3	3	3	3	1060
	STD	77	42	10	23	89	8	162	1	2	2	2	2	206
Sep	Estimate	183	6	3	87	51	11	526	0	15	15	15	15	882
	STD	46	5	3	82	35	9	540	0	14	14	14	14	550
Oct	Estimate	0	0	0	0	0	0	0	0	0	0	0	0	0
	STD	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Catch	1378	69	24	198	540	105	1177	150	48	48	48	48	3689
		158	46	11	91	113	33	588	109	19	19	19	19	638

APPENDIX D-11. STRAIT OF GEORGIA ROCKFISH CATCH SUMMARY, 1999.

Month		Statistical Area											Total
		13	14	15	16	17	18	19	28	29			
Apr	Estimate	1156	89	34	559	185	141	478	890	32	32	3564	
	STD	434	47	24	311	141	63	187	801	26	26	994	
May	Estimate	2040	177	86	1289	308	54	412	395	166	166	4927	
	STD	497	125	104	624	93	24	131	220	114	114	866	
Jun	Estimate	2924	393	17	1038	1854	122	1110	516	139	139	8113	
	STD	881	252	11	435	343	63	372	454	95	95	1226	
Jul	Estimate	5709	1082	229	3794	1608	423	1970	406	149	149	15370	
	STD	843	378	91	1885	279	131	423	227	63	63	2178	
Aug	Estimate	6309	358	174	8744	1366	167	1602	3196	423	423	22339	
	STD	740	140	69	2116	418	67	453	3032	168	168	3828	
Sep	Estimate	3857	387	51	2356	141	443	4030	0	102	102	11367	
	STD	764	425	25	1140	94	253	2517	0	69	69	2912	
Oct	Estimate	1575	0	0	0	0	0	0	0	0	0	1575	
	STD	540										540	
Total	Catch	23570	2486	591	17780	5462	1350	9602	5403	1011	1011	67255	
		1829	651	159	3163	638	307	2629	3184	244	244	5605	

APPENDIX D-12. STRAIT OF GEORGIA CATCH SUMMARY FOR OTHER FINFISH, 1999.

Month		Statistical Area											Total
		13	14	15	16	17	18	19	28	29			
Apr	Estimate	303	14	0	79	27	52	311	0	0		786	
	STD	136	17	0	48	32	47	198	0	0		252	
May	Estimate	112	16	0	221	10	5	282	23	19		688	
	STD	42	20	0	105	8	4	107	19	16		159	
Jun	Estimate	243	36	9	487	140	8	478	5	47		1453	
	STD	86	19	6	353	58	6	175	5	46		411	
Jul	Estimate	699	278	24	1169	22	135	692	1	33		3053	
	STD	179	123	18	538	9	88	242	1	22		635	
Aug	Estimate	723	121	82	1470	25	43	336	1	101		2902	
	STD	119	79	70	464	12	24	101	2	45		504	
Sep	Estimate	363	190	5	2225	12	0	1930	2	182		4909	
	STD	96	214	4	1337	13	0	1184	2	114		1805	
Oct	Estimate	144	0	0	0	0	0	0	0	0		144	
	STD	57										57	
Total	Catch	2587	655	120	5651	236	243	4029	32	382		13935	
		294	261	73	1559	70	103	1246	20	134		2043	

APPENDIX E-1. TOTAL ESTIMATED EFFORT AND SPORT CATCHES FOR THE STRAIT OF GEORGIA, 1999*.
Totals include data for all months surveyed.

Year	Effort	Salmon Catch					Salmon Released			Groundfish Catch					
		Chinook	Coho	Chum	Pink	Sockeye	All Salmon	Chinook	Coho	All Salmon	Halibut	Lingcod	Rockfish	Dogfish	Other
1980	510400	204100	393500	0	0	0	609200	0	0	0	0	0	0	0	0
1981	494604	197239	317091	0	0	0	572964	0	0	215556	0	51319	77889	2280	8633
1982	559395	124390	411686	0	2846	0	547196	0	0	578169	0	77035	176302	7214	43126
1983	574257	198433	404031	0	54852	0	668142	0	0	775502	0	73800	209099	4518	94100
1984	651090	369445	443590	0	10229	0	828290	0	0	639676	0	137492	158676	4649	84353
1985	628513	234838	728197	0	91246	0	1062939	0	0	703264	0	77103	134112	4680	58531
1986	582946	181896	571980	919	3145	918	760361	0	0	166862	0	70817	167783	5212	65081
1987	589731	121081	641572	3544	90004	8867	867029	0	0	1068027	0	65789	136270	4110	61497
1988	664517	119117	1084790	4802	8843	16376	1235680	0	0	935330	0	65929	194735	4114	71045
1989	603331	132846	497223	7819	123046	13356	775616	190186	0	1201306	0	52329	199898	3672	57165
1990	543368	111914	630033	2978	11549	30669	792440	221081	0	704554	0	31716	154858	2679	30016
1991	466749	115523	157111	5273	249662	23521	551521	178921	0	622445	0	8214	173383	4972	23469
1992	467559	116581	595554	5927	19085	6745	744564	165710	0	417401	0	5968	135763	1802	32146
1993	528508	127576	861323	3096	173143	23766	1217381	182111	0	526817	0	7239	104009	1907	35218
1994	461129	70839	294767	4279	18476	14054	410352	147571	0	418387	0	6885	162431	1244	35840
1995	323642	62173	86145	4023	183938	5897	347401	112324	0	317735	0	4829	112299	1884	32365
1996	289423	89589	127890	3474	7887	2419	233469	180238	0	366379	0	3733	102818	1497	39786
1997	268797	56332	104953	1761	111124	16887	293605	65421	0	404166	0	4086	87453	2528	52088
1998	162296	20923	1376	3624	6848	4474	38449	34786	20992	2340	2203	3291	84251	0	43565
1999	164282	43588	478	4404	27845	492	76808	60423	14000	105792	2489	3691	67256	0	13937

"0" indicates that no catch estimates were generated

*SOURCE: Catch statistics 1980-1998 from unpublished creel survey data.

APPENDIX E-2. TIDAL EFFORT STATISTICS AND SPORT CATCH ESTIMATES OF CHINOOK AND COHO FOR THE STRAIT OF GEORGIA, 1960 TO 1980*.

Year	Effort** (boat trips)	Catch	
		Chinook	Coho
1960	189,150	83,000	238,000
1961	199,935	63,000	152,000
1962	205,547	86,000	167,000
1963	247,590	65,000	199,000
1964	198,120	51,000	182,000
1965	250,020	53,000	175,000
1966	259,100	80,000	249,000
1967	254,500	115,000	200,000
1968	265,030	150,000	250,000
1969	281,475	185,000	200,000
1970	306,255	220,000	500,000
1971	341,123	255,000	800,000
1972	300,349	287,000	335,000
1973	293,141	272,000	373,000
1974	443,441	269,000	772,000
1975	334,490	398,000	454,000
1976	340,729	490,000	415,000
1977	363,350	372,000	682,000
1978	369,035	500,000	1,103,000
1979	404,710	350,000	708,735
1980	510,400	204,100	393,500
1981	494,604	197,239	317,091
1982	559,395	124,390	411,686

*SOURCE: Coho catch statistics: 1960-1978 from Argue et al. (1983); 1979 from R. Kadowaki (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.); 1980-1982 from unpublished creel survey data.

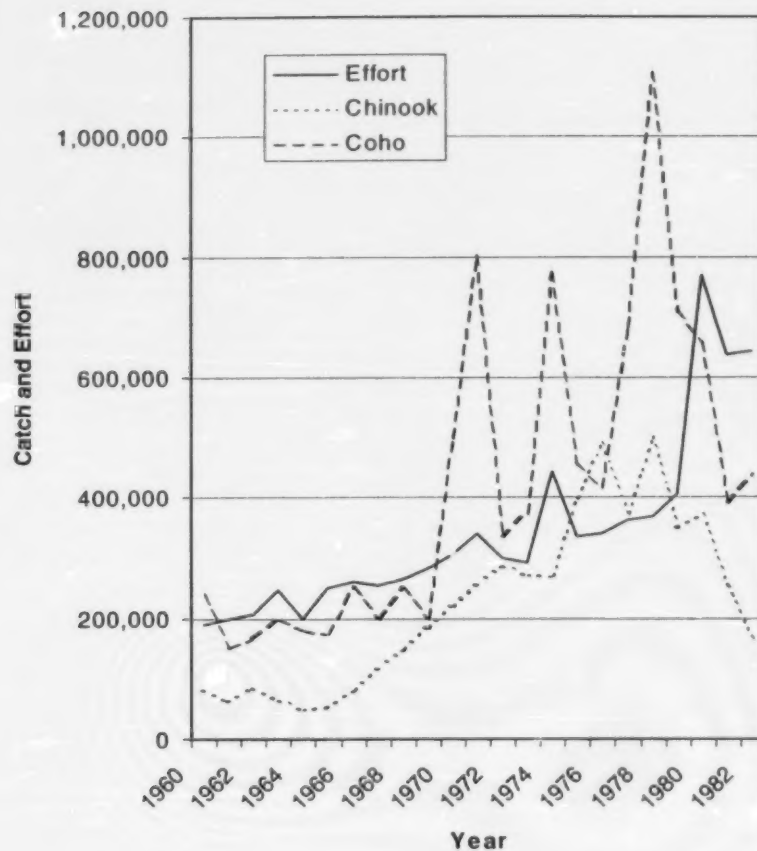
Chinook catch statistics: 1960-1977 from Argue et al. (1983); 1978 and 1979 from B. Riddell (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.) following the methods of Argue et al. (1983); 1980-1982 from unpublished creel survey data.

Effort statistics: 1960-1979 from published and unpublished Fisheries Officer statistics; 1980-1982 from unpublished creel survey data.

**Effort prior to 1980 (the start of the creel survey) may not represent boat trips.

APPENDIX E-3. STRAIT OF GEORGIA HISTORICAL CATCH* AND EFFORT**

Historical Catch and Effort



GRAPH, 1960 TO 1982.

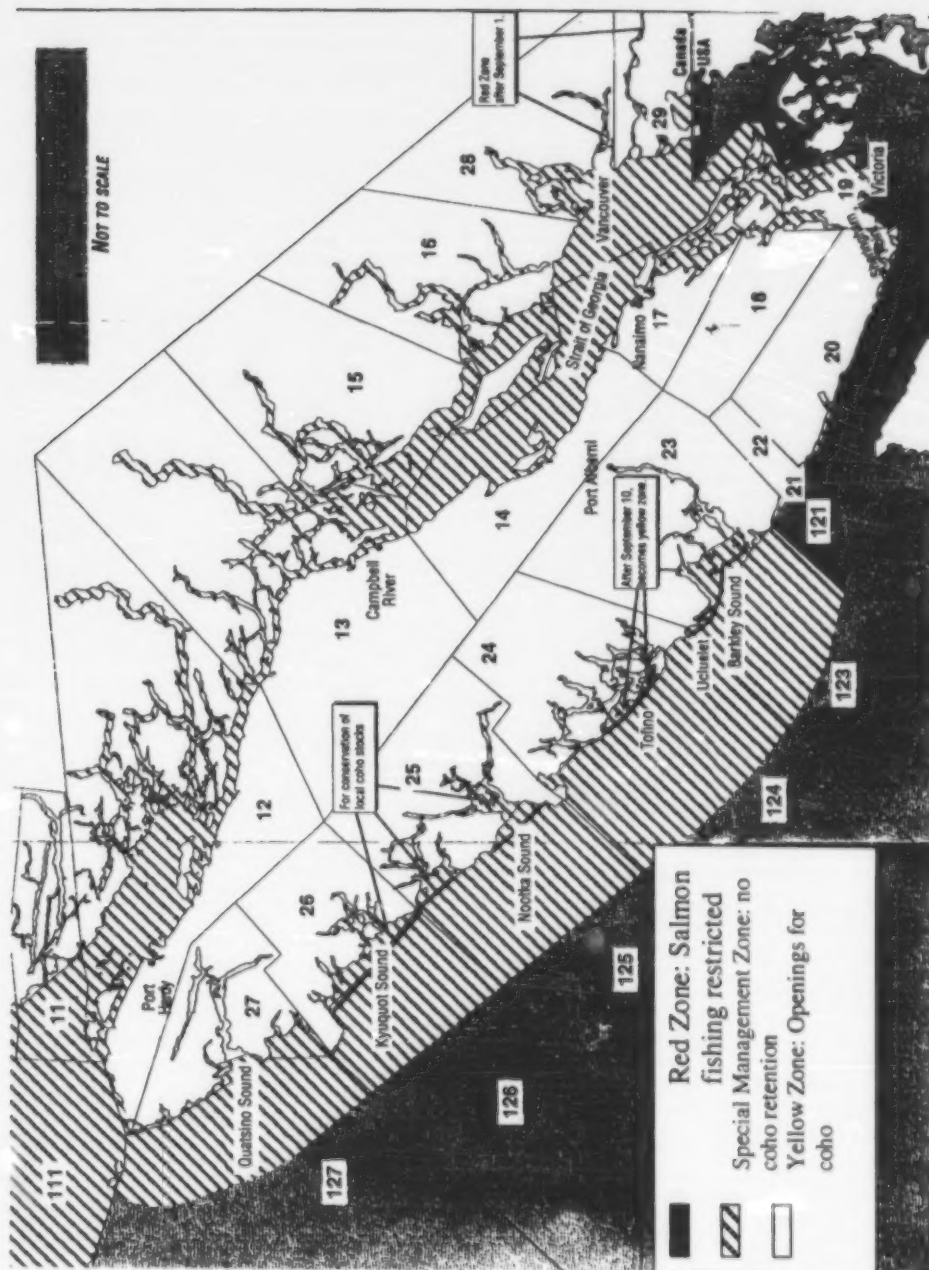
*SOURCE: Coho catch statistics: 1960-1978 from Argue et al. (1983); 1979 from R. Kadowaki (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.); 1980-1982 from unpublished creel survey data.

Chinook catch statistics: 1960-1977 from Argue et al. (1983); 1978 and 1979 from B. Riddell (Fisheries and Oceans Canada, Pacific Bio. Stn. Nanaimo, B.C. pers. comm.) following the methods of Argue et al. (1983); 1980-1982 from unpublished creel survey data.

Effort statistics: 1960-1979 from published and unpublished Fisheries Officer statistics; 1980-1982 from unpublished creel survey data.

**Effort prior to 1980 (the start of the creel survey) may not represent boat trips.

APPENDIX F. SOUTH COAST FISHING ZONES, 1999.



APPENDIX G. HISTORICAL REGULATION CHANGES AFFECTING THE STRAIT OF GEORGIA AND NORTHERN VANCOUVER ISLAND SPORT FISHERY*.

- 1981 July 1, chinook minimum size limit changed from 30 cm to 45 cm.
Minor spot closures, E.g. River mouths only.
- 1982 Annual bag limit established at 30 chinook.
- 1985 May 15, daily limit reduced from 4 to 2 chinook.
June 5, annual limit reduced from 30 to 20 chinook.
Spot closure plan implemented (32 closures), similar program continues to present day.
- 1988 April 1, annual bag limit reduced to 8 chinook.
A proposed chinook minimum size limit of 62 cm (not enforced).

The Strait of Georgia has been divided into 2 areas: 1. Victoria area, Cadboro Bay to Sheringham Point. 2. The rest of the Strait of Georgia.

- 1989 Feb 1, 62 cm minimum size limit for chinook.
Aug 16, Victoria area, minimum size limit for chinook reduced to 45 cm and the annual limit increased to 20 fish. Strait of Georgia, chinook size limit of 62 cm and an increase in annual limit to 15 fish.
- 1992 Feb 6, daily limit for lingcod reduced to 1 and minimum size limit of 65 cm established.
- 1994 Daily possession limit for coho reduced from 4 to 2, minimum size limit increased from 30 cm to 41cm.
Annual limit of 10 lingcod.
- 1998 July 1, barbleless hooks in tidal waters.
May 4, non-retention of coho in all tidal and non-tidal waters (some exceptions).
Creation of Red zones (no fishing) and Yellow zones (fishing allowed).
Spot closures for sockeye.

*SOURCE: regulation changes 1981 and 1982, English et al. (1986); 1985 T. F. Shardlow, et al. (1989); 1988 T. F. Shardlow, et al. (1989); 1989 L. D. Collicutt et al. (1990); 1992, 1994 Wendy Grider (Fisheries and Oceans Canada, Vancouver, B.C. pers. comm).

APPENDIX H. SPECIES BREAK DOWN OF COMMONLY INCLUDED WITH
OTHER GROUND FISH.Common Names

Pacific Cod	<i>gadus macrocephalus</i>
Pacific Tomcod	<i>Microgadus proximus</i>
Walleye Pollock	<i>Theragra chalcogramma</i>
Pacific Hake	<i>Merluccius productus</i>
Perch (all species)	Family <i>Scorpaenidae</i>
Greenlings (all species)	Family <i>Hexagrammidae</i>

APPENDIX I. SALMON CATCHES AND EFFORT BY MONTH AND
STATISTICAL SUB-AREA FOR NORTHERN VANCOUVER ISLAND, 1999.

Month	Sub Area		Effort	Catch						Released		
				Chinook	Chum	Coho	Pink	Sockeye	Total Salmon	Chinook	Coho	
7	12A	Catch	1630	398	16	4	502	36	956	402	650	
7	12A	STD	704	182	9	3	217	19	413	203	306	
7	12B	Catch	8122	1891	85	27	2683	167	4852	1851	3156	
7	12B	STD	1626	372	31	16	657	49	1047	425	719	
7	12C	Catch	1929	437	21	7	661	38	1164	419	739	
7	12C	STD	275	67	7	4	118	10	183	83	136	
7	12D	Catch	407	96	4	1	132	9	241	95	160	
7	12D	STD	142	34	2	1	50	4	87	37	61	
8	12A	Catch	4211	920	97	81	7954	250	9301	517	3726	
8	12A	STD	1173	271	30	34	2251	55	2593	168	1136	
8	12B	Catch	12381	2697	294	238	23364	796	27388	1513	10869	
8	12B	STD	2397	575	78	92	4653	155	5353	378	2438	
8	12C	Catch	3545	773	84	68	6691	225	7840	433	3116	
8	12C	STD	183	73	18	22	441	38	494	65	315	
8	12D	Catch	218	47	6	4	411	17	485	26	188	
8	12D	STD	8	5	1	2	27	3	29	5	23	
9	12A	Catch	856	67	0	0	1538	0	1604	177	1570	
9	12A	STD	61	24	0	0	232	0	235	84	315	
9	12B	Catch	4893	405	0	0	7197	0	7603	1165	8915	
9	12B	STD	393	149	0	0	1085	0	1103	509	1984	
9	12C	Catch	854	74	0	0	1009	0	1084	227	1546	
9	12C	STD	89	32	0	0	154	0	158	105	387	
9	12D	Catch	105	8	0	0	217	0	225	19	194	
9	12D	STD	8	3	0	0	33	0	33	11	40	
Total			Catch	39151	7813	607	430	52359	1538	62743	6844	34829
			STD	3249	781	92	102	5354	177	6183	826	3486

APPENDIX J. GROUND FISH CATCHES AND EFFORT BY MONTH AND
STATISTICAL SUB-AREA FOR NORTHERN VANCOUVER ISLAND, 1999.

Month	Sub Area	Effort	Catch			
			Halibut	Lingcod	Rockfish	
7	12A	Catch	1630	524	80	781
7	12A	STD	704	244	36	335
7	12B	Catch	8122	2465	423	4064
7	12B	STD	1626	493	114	924
7	12C	Catch	1929	566	104	988
7	12C	STD	275	90	22	163
7	12D	Catch	407	126	21	201
7	12D	STD	142	45	8	73
8	12A	Catch	4211	492	193	1963
8	12A	STD	1173	133	56	506
8	12B	Catch	12381	1490	578	5900
8	12B	STD	2397	316	132	1098
8	12C	Catch	3545	425	165	1683
8	12C	STD	183	62	26	156
8	12D	Catch	218	29	11	111
8	12D	STD	8	5	2	11
9	12A	Catch	856	92	74	522
9	12A	STD	61	38	27	153
9	12B	Catch	4893	431	348	2658
9	12B	STD	393	176	125	740
9	12C	Catch	854	60	49	413
9	12C	STD	89	25	18	113
9	12D	Catch	105	13	10	70
9	12D	STD	8	5	4	22
Total		Catch	39151	6713	2056	19354
		STD	3249	684	230	1752